



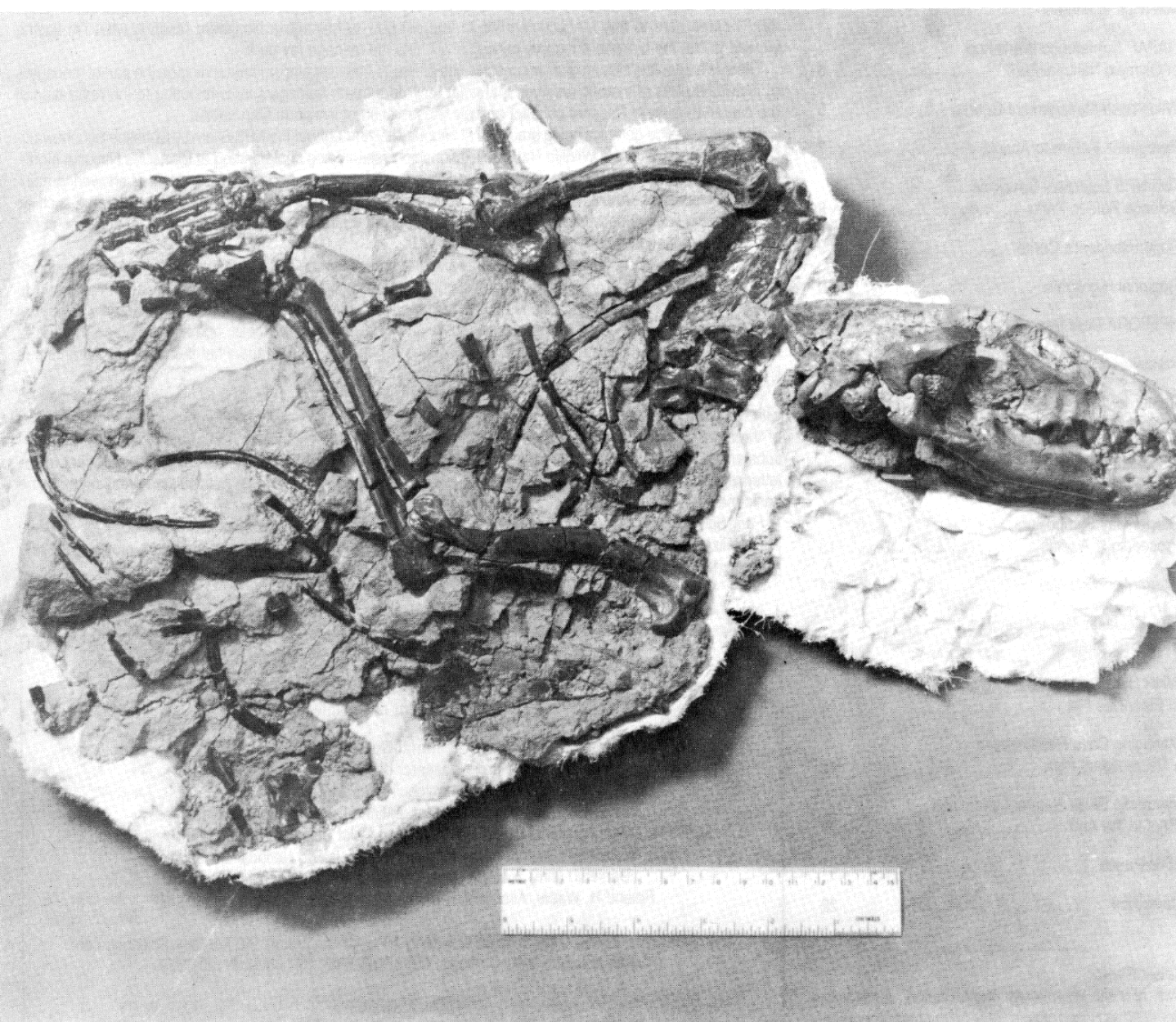
PARK SCIENCE

A RESOURCE MANAGEMENT BULLETIN

NATIONAL PARK SERVICE
U.S. DEPARTMENT OF THE INTERIOR

VOLUME 5 – NUMBER 3

SPRING 1985



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A report to park managers of recent and on-going research in parks with emphasis on its implications for planning and management

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Cover Photo:

This recently discovered dog skeleton, tentatively identified as Hesperocyon, may be the most complete of its type ever found in the John Day formation.

Spring Editorial

The scientific approach to ecosystem management seems to be going through a stage of planet-wide synthesis. The news in this issue underscores the holistic approach everywhere being taken in pursuit of general principles and of the widest possible contextual sciencescape into which various pieces of these applied principles can be fitted.

Scientists and managers are seen in growing numbers, to be working together. Beyond their individual research and management goals there looms, for both, the overall objective of perpetuating the resources of Earth.

The real strides in conceptualizing the world's Biosphere Reserve network and in devising a strategy for worldwide action are all the more impressive in the face of U.S. withdrawal from UNESCO at last year's end, (page 23): The grand plan formulated by committees working at the highest levels of the Man and the Biosphere Program is exquisitely matched at the other end of the MAB hierarchical scale by the Bob Barbee quote (page 22): "I came here to this MAB conference to find out how to manage a biosphere reserve; what I'm finding instead is that the biosphere reserve concepts will help me manage my park."

There is a beautiful closing of an impressive circle here . . . the dawning understanding on the part of managers of individual parts of various reserves that what they do as park managers is contributing to the realization of the overall Biosphere Reserve concept and the preservation of livable human habitat.

The conservation genetics being practiced at various sites throughout the NPS system by Christine Schonewald-Cox and Co., (page 4) the Wildlife Habitat Relationship system being implemented at Pinnacles National Monument (page 16), the growing attention to other Systemwide problems and the development of answering management tools — all are evidence that a new age of understanding is a-borning. Television programs such as Nova and the various network science specials are keeping up the drumbeat of information, alerting the public to the world-scale of most of our problems.

Perhaps the most compelling part of this awakening process is the fact that it is not just "natural resources" we are dealing with, but the life-support systems of the biosphere. Natural resources is a term referring to something that, more accurately, is a cultural matter. It is human beings — out of their peculiar, uniquely social wisdom — who "decide" what is a natural resource and what is not. It is, it was, and it probably always will be a matter of human opinion as to just what constitutes a natural resource and what is merely a natural fact of life or a natural nuisance.

The life-support systems are another matter entirely. The "synthesis" referred to here is mainly concerned with the general principles of how systems work — how they can be manipulated in order to favor the survival of threatened gene pools of plant and animal materials — how they can be made to produce more or less of substances and materials we need or cannot stand. The Biosphere Reserves are especially important in the latter regard, dealing as they do with so-called "natural" ecosystems paired with manipulated areas of the same basic make-up.

Park Science only reports what is going on. But sometimes it's pleasant to look over the copy for an issue and realize that, small as we are, we are actively engaged in a very large and important movement — the movement from ignorance to wisdom, from drift to directed progress.

RUSSELL E. DICKENSON, Director
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ISSN-0735-9462

Paleontological Baseline Established at John Day Fossil Beds

By Kim Sikoryak

Recently authorized as a National Monument in 1974, the John Day Fossil Beds of eastern Oregon have been recognized as a paleontological resource for over 100 years. Preserving a remarkably complete record of the terrestrial life of the Tertiary period – that time after the extinction of the dinosaurs and before the Ice Age – the colorful badlands of the upper John Day basin were visited by some of the greatest paleontologists of the 19th Century.

The frenzied activity of those early years tapered off after 1900. Amateur fossil hunting became a much pursued post-war recreation in Oregon and, facing such disruptive activities at their research localities, professional workers, with a few notable exceptions, soon quit the field. With the protection afforded by inclusion in the National Park System, these important deposits are once again available for study.

As a first step, park management contacted two leading students of the region in 1976. J. Arnold Shottwell of the University of Oregon reported on the scientific history and significance of the new park and John M. Rensberger, then at the University of California, provided basic paleontologic information regarding park holdings. It soon became evident that park staff would have to quickly establish ties to the professional community and master basic field and curatorial techniques if resources were to be protected from significant loss.

Concentrated effort was directed toward the John Day Formation. This geologic unit is the most richly fossiliferous and is undergoing the most rapid erosion. The soft, brittle claystone, derived from 20-30 million year old volcanic ash deposits of the ancestral Cascades, houses excellently preserved mammalian fossils as well as turtles, lizards, snails and plant materials. Remains are scattered over thousands of acres of badlands and are challenging to spot. Every rain coats the surface with a fresh layer of slick, pasty mud. Below the surface, fossils rapidly disintegrate due to the effect of invading moisture. If not removed quickly after discovery, specimens soon are lost.

With the cooperation of Dr. John Ruben of Oregon State University, the park began a systematic overview of the John Day Formation beds on the Monument in 1978. By 1980, it was apparent that erosion had exposed considerable new material at the surface. The most significant finds were excavated and taken to OSU for preparation. A series of exhibits of actual fossil material was the first fruit of this effort and generated considerable visitor interest.

Imprecise locality data have greatly limited the usefulness of historic collections. Current paleontological analyses demand much more specific site data. Since the John Day beds span so great a period of time, paleontologists feel certain that the diversity of mammalian species found here represents developmental stages of phyletic lines: series of ancestors and descendants. But with poor locality control, the stratigraphic position of specimens is indeterminable. The data are simply not complete enough to indicate who descended from whom.

John Rensberger made the first move toward resolving this situation in the early 1970s. Studying the abundant teeth and jaws of pocket gophers, he was

able to erect a series of biostratigraphic zones using the presence of various species of these fast-evolving rodents as mileposts through the column of sediments. This work addressed the uppermost parts of the formation, however, which rarely occur in the park. Such a system, while academically valuable, could not be effectively used to map newly found specimens on a routine basis.

John Ruben solved the problem in 1981. With the aid of the Oregon Air Guard, he produced high resolution stereo-pair photographs that year and in 1982. Dr. Hugh Wagner, of the California Academy of Sciences, joined the research effort, using the air-photos to plot exposed material and correlate findings to facilitate further research and aid park management. To date, over 1000 specimens have been recovered from the field and mapped with such precision that researchers can return to within a meter or two of collection sites. This degree of spatial control over such a large area is probably unprecedented and portends major research opportunities.

The wealth of specimens and data generated by 1984 was such that a permanent full-time museum technician position was created at the park to insure responsible curation and expand interpretive opportunities. Fossil remains are in many ways the orphan children of NPS museum collections (see Superintendent's corner, Fall, 1984). The park interpreter and

museum technician have broken much new ground, working to maximize the potential of recovered specimens and insure standard treatment and data collection.

The outlook is optimistic. A modern, though modest, fossil preparation laboratory is now in operation on site. This facilitates in-house preparation of exhibit specimens, is available to researchers with materials needing immediate attention, and allows visitors to witness the challenging but exciting work of freeing remains from the rock. Investigation has begun regarding computerization of site data and catalog information. A system for secure yet visible storage of teeth and small jaws has been developed. And the beginnings of fuller understanding of why concentrations of fossils occur where they do is helping park management to decide manpower allocation and trail design. A second, more ambitious series of exhibits nears completion, displaying the tremendous rewards this groundwork effort already has yielded.

We've literally just scratched the surface. Though park staff can now salvage, stabilize, and curate materials that otherwise would be lost, the full potential of John Day Fossil Beds awaits renewed professional activity. Paleontologists, the park, and the public will reap the benefits.

Sikoryak is Park Ranger (Interpretation) at John Day Fossil Beds National Monument.



Rough terrain and scattered deposits make for challenging field work. Dr. Hugh Wagner excavates a rhino jaw in Blue Basin.

Conservation Genetics Research Finds Systemwide Applications

By Jean Matthews, *Park Science* editor

Editor's Note: For earlier reports and impressions from this rapidly developing field, see *Park Science* Fall 1982, pp. 5-6, and Winter 1983, pp. 3-5, where assessments appear by NPS research scientists Bill Robertson, Lloyd Loope, Chuck Stone and Jim Kushlan.

A mosaic of management needs and science responses that suggest a promising new, holistic approach in the area of conservation genetics can be seen developing throughout the National Park System. Badlands NP Supt. Gil Blinn, in a Superintendent's Corner (*Park Science*, Fall 1984, p.9) described how data from an NPS scientist helped him carry the day with a South Dakota state board that had resisted his efforts to introduce Colorado bison into his Badlands herd. Blinn's is only one of a rapidly growing number of applied science stories stemming from this new field of expertise and its prime practitioners in the Park Service – Christine Schonewald-Cox, J.W. Bayless, and Richard Baker.

These three, now stationed at the University of California/Davis's NPS Cooperative Park Resources Study Unit, have been responding on a piecemeal basis (see further on in this story) to similar calls for help from parks all over the System.

Attention to the systematic nature of the National Park System's growing problem with regard to small populations of threatened plants and animals and to the pertinent research for methods to deal with these situations was sharpened in 1982, with the NPS-sponsored Conference on Genetics and Conservation in Washington, D.C. At that meeting, leading geneticists from around the world met and discussed the rapid increase in the rate of extinctions, coupled with the whole panoply of emerging insights into the dynamics of genetic systems that are common to all living organisms. Too quote one NPS biologist: "Most of us were blown away by the advances in genetics, biogeography and evolutionary biology that had occurred in the previous handful of years."

Partly as a result of the information exchanges and insights engendered by that meeting, a strong new interdisciplinary approach to wildlife conservation has arisen. "I don't think many of the ecologists there had any idea, when they came, of the state of genetics knowledge and the tools for probing it," said Doug Houston, research biologist with the Pacific Northwest Region. Houston's recent review of the genetic differentiation of salmon stocks in the Olympic Peninsula waters further convinced him of the need for NPS to learn more and take more enlightened advantage of the gains.

"However," Houston added, "an enormous amount of work remains to be done in order to translate the new information on the genetics of populations into guidelines useful to the managers of natural areas."

Schonewald-Cox, who – with strong support from the Washington NPS office – arranged for and chaired the 1982 conference and who was lead editor of the 722-page *Genetics and Conservation* (Benjamin

Cummings, Menlo Park CA, 1983) that grew out of the meeting, has been attempting to organize her own work and that of her two colleagues – Bayless and Baker – so that their responses to management needs in this field take place within the context of the total National Park System.

"Instead of responding to a brushfire here and a conflagration there," Schonewald-Cox said, "we should be looking at the total situation. This is the sensible way to attack the various problems associated with small populations in limited areas and to make the most efficient, effective use of the new knowledge we have and are continuing to generate."

As a result of the calls for help from around the System and the hypotheses that are emerging from their efforts to synthesize and apply the new science, Schonewald-Cox and Bayless have proposed a seven-part research project aimed at providing specific answers to certain problems faced by management and guidelines and consultation services for others.

Starting with shoestring funding contributed by the Western, Pacific Northwest, Southwest, Southeast, and Midwest Regions, the effort is entitled Inter-regionally Funded Project on Small Population Management. Although the project is necessarily exploratory in nature, the products are functional – each part designed to address a portion of the range of activities and information that managers must have if the degradation and extinction of local populations are to be slowed.

Emphases are on small population genetics and demography and on vertebrates, although not exclusively so. The seven parts of the project will be integrated to produce material on conservation techniques and to improve the quality of consultation available. The work is connected with ongoing research at other Universities and under State and Federal agencies, and thus a mutually beneficial process will ensue. Products of NPS research will contribute to the developing discipline of conservation biology, and developments in the discipline will contribute to the NPS-generated products.

Built into the project's seven parts is the tie-in to resource management. Training workshops are projected for selected resource managers and scientists who have not been directly involved in the project. The workshops will incorporate ongoing research results and will offer training on how to make use of genetics and demography in conservation and management.

The plan's seven parts are: I. levels of demographic complexity, II. relationships between population size and park size, III. factors contributing to the decline of local populations, IV. techniques for founding and restoration, V. comparative evaluation of laboratory techniques, VI. risk analysis (still awaiting funding), and VII. interactive data base for small population management.

The "deliverables" will include prototype guidelines for resource managers dealing with small populations. Throughout the project, consultation will be given to parks upon request; as funding is made available, workshops will undergird these spot efforts.

Working out of their U/Cal Davis lab, Schonewald-Cox and Company have been responding piecemeal to calls for help from packs with small population problems. They must deal with each instance on an individual basis, but they are also uniquely positioned to see these problem areas as pieces of a larger picture – one that affects the overall condition of the National Park System and involves the overall mission of the National Park Service.

Progress already has been made in all seven project areas; e.g., collaboration is underway to test and continue to develop the Salwasser and Sanson system (USFS) for determining habitat and population size requirements of species of special conservation interest. Involvement from resource management at Sequoia/Kings Canyon NPs has been established informally for testing this system on bighorn sheep.

Also, a manuscript is in preparation analyzing the foundings of elk populations as part of restoration projects in California, Pennsylvania, and Texas. Of the populations for which data are available on founder group size, about 50 percent now are extinct. The remaining populations with only one or two exceptions are in desperate need of management, i.e. veterinary care, supplementary feeding, etc.

Morphometric analyses are underway to compare environmental versus genetic changes in cranial phenotype for elk. Collaboration has been discussed and is being solidified in North America and New Zealand, (the latter being home for transplanted Nelson's or Rocky Mountain elk). Use of the morphometric measurements of elk resulted in consultations with four NPS Regions – Rocky Mountain (Badlands), Pacific Northwest (Rainier), Western (Tule elk and coastal Northwestern Roosevelt elk populations), and Southwest (Guadalupe Mountains).

In addition, consultation has occurred with investigators at the National Institutes of Health, the zoological park community, and scientists at the University of Idaho. Possible use of laboratory analyses of genetic diversity is being explored for use with grizzly bear (in coordination with Chris Servheen, UWFWS chairman of the Interagency Grizzly Bear Team), with elk (in coordination with Wind Cave and Teddy Roosevelt NPS areas), and with bighorn sheep (in concert with J. Keay in Sequoia/Kings Canyon NPs).

Schonewald-Cox disavows any expectation that the entire seven-part plan can be accomplished in the four-year time frame used to present it. "The proposal is the ideal," she said, "and few of us have the luxury of working out our fondest dreams."

"The enduring and wholly achievable element of our plan is its holistic nature," she said. "Our research will work its way through the complete design along the paths of greatest opportunity – the areas where scientific capabilities best meet management's information needs. The enormous benefit will be the fact that everything we do will be done within the context of the larger plan and the entire National Park System."

"In addition," she said, "possibilities abound for melding Park Service research with that of other agencies . . . further tightening the research effort and at the same time broadening both its scientific implications and its management applications."

Scientists Share Expertise Through Olympic Seminars

By Jerry Edelbrock

In the autumn of 1984, Olympic NP initiated a program which provided the general public an opportunity to study in-depth the natural resources of the park from the wilderness coast to the lush rain forests and alpine ecosystems. A program of educational field seminars began with the help of resource managers, scientists, and artists who have studied and worked in Olympic NP. These professionals served as instructors for small seminar groups and used the forests and trails of Olympic as a "classroom."

The expertise of the instructors covered a variety of fields including plant ecology, photography, art, mycology, and wildlife biology. Thanks to the willingness of these instructors and the whole-hearted support of Supt. Robert Chandler and Chief Park Naturalist Henry Warren, the field seminar program proved to be tremendously popular and a new extension of Olympic NP as an educational resource.

One of the most successful seminars was the "Natural History of Roosevelt Elk" held in the Hoh River Valley on a colorful September weekend during the elk rutting season. The course was designed to provide a detailed look at the behavior, habits, life cycle, habitat, and general management concerns of the Roosevelt elk through discussion and direct observation in the Hoh River Valley. The team of instructors included Dr. Ed Starkey, research biologist with the NPS stationed at Oregon State University, Dr. Doug Houston, research biologist based at Olympic NP and noted authority on elk throughout North America, and Bruce Moorhead, Olympic NP wildlife biologist.

The seminar provided an opportunity for these scientists to share their knowledge, experience, and field methods with park visitors who had a particular interest in these large animals. Discussions centered around population dynamics, browsing effects on vegetation, nutritional requirements, censusing, the use of biotelemetry, carrying capacity and other related subjects. On day-hikes through the forest and onto river gravel bars, participants discovered the tell-tale sign of elk, and they heard various interpretations of the sign as seen through the eyes of experienced scientists. Later on, class members became familiar with some of the research tools used during extensive field studies. The instructors demonstrated radio transmitter collars, directional antennae, and tranquilizer guns and darts.

Early in the morning, just before dawn, the hardest members of the class ventured out with their instructors onto the gravel bars of the Hoh River in hopes of observing a bull elk with full antlers and his harem of cows. They were rewarded with just such a sight as well as a sparring match between two young bulls. There was ample material for photography as antlers clashed and gravel sprayed.

The participants in this seminar came from a wide spectrum of professional disciplines. Some were interested in management concerns because of their own professional responsibility for managing small herds of elk. Others were there because they believed a better understanding of these animals would increase their chances of success during the hunting season. Several photographers were in search of new ways to locate, approach and capture wildlife on film.

Still others enrolled in the course just for the experience of spending two days in the field with scientists who have a wealth of knowledge and experience.

Olympic National Park, in conjunction with the non-profit Pacific Northwest National Parks and Forests Association, plans to continue offering field seminars for those individuals who want to explore and understand the resources of the Pacific Northwest. The 1985 program includes 24 seminars scheduled between March and September, and begins with a winter course, "Olympic Weather and Snow," taught by Dr. Ed LaChapelle, professor emeritus at the University of Washington and an expert on glaciers, snow and avalanches. He served as director of the Blue Glacier Project on Mt. Olympus for 20 years. His seminar will include discussion and field work on Hurricane Ridge examining the physical features of snow and ice and the weather patterns that produce them. Participants will be on skis or snowshoes.

Other seminar topics include wilderness photography, birding on the coast and ocean, Ozette archeology, wildflowers, Makah Indian culture, canoeing, backpacking for women, geology, mosses and lichens, rain forest ecology, and mushrooms of Olympic NP.

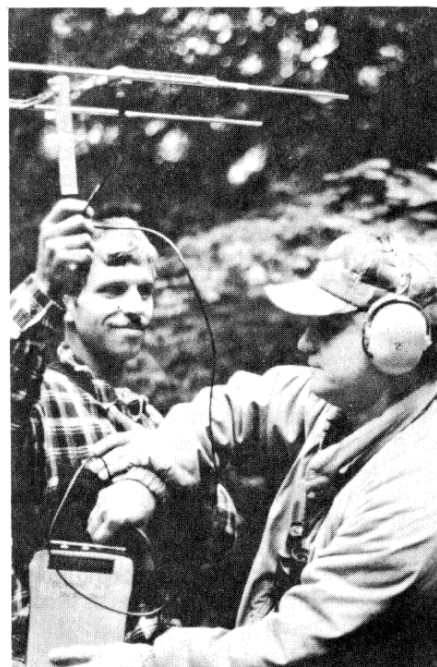
Several joint programs are offered in conjunction with North Cascades NP Complex (Wilderness Photography at Stehekin by Pat O'Hara), Mt. Rainier NP, (Alpine Ecology by Drs. Ola and John Edwards; Glaciology by Carolyn Driedger), and the Gifford Pinchot National Forest (Life Returns to Mt. St. Helens by Dr. Ernie Karlstrom).

Judging from the tremendously positive response of participants last fall and the large number of enrol-

lees in the 1985 program to date, field seminars appear to be an excellent way for scientist to relate national park research to the general public through an educational and recreational experience.

Further information on the 1985 program is available from the Seminar Coordinator, Olympic National Park, 600 East Park Avenue, Port Angeles, WA 98362-6798, telephone (206) 452-4501 ext. 220; FTS 396-4220.

Edelbrock is Field Seminar Coordinator at Olympic NP.



Radio telemetry equipment is explained here by Bruce Moorhead Olympic NP Research Biologist, as a member of the class hoists the antenna.



Using the dirt as a blackboard, Doug Houston, PNR Research Biologist, draws a graph of elk carrying capacity for the ecosystem under study. Fellow NPS instructors Ed Starkey (lower right) and Bruce Moorhead (upper left) and students look on.

letters

To the Editor:

I am enclosing the abstract (see p. ? this issue) of a paper scheduled for presentation at the 50th North American Wildlife and Natural Resources Conference in Washington, D.C. (March 15-20, 1985). The paper will trace the history of park science, describe the current science program, and discuss a likely future scenario. I can't really say that much in the way of new ideas or material will be included. However, working on the paper and discussing it with park scientists has sharpened my perspective somewhat.

I would urge all park scientists to spend some time with the historical aspects of park science. (*Editor's Note: See the Autumn 1983 issue of the George Wright FORUM*). Dust and cobwebs have tended to obscure many important attributes of our program. Dark as it may seem some days – decades in some cases – we *have* made progress. In fact, our contributions have been distinct and, in many cases, of broad conceptual merit. Parks are no longer mired in the mediocrity of scientific isolation.

Certainly, the future is cloudy, but I can't recall many times when that was not so. We have the capability to rise above the clouds and make our own future with the proper attitude. Of course, attitudes have a price in terms of financial support, but the ultimate scientific resource – the human brain – is essentially free. There is no material replacement for a good idea and little to restrain that idea when an opportunity for its use appears.

So much for my philosophy. If you decide to publish my philosophical rhetoric, watch for missiles through your doorway. Cheers!

Clifford J. Martinka, Senior Scientist
Glacier National Park

To the Editor:

In looking at the Fall 1984 edition of *Park Science* I was interested in some of the subjects discussed, such as "urban soils of the Mall in Washington, D.C.". I am wondering whether you might encourage some of your readers to write something on the problems involved in maintenance of the C & O Canal, which is one of the nation's important historical parks. The Potomac River and the C & O Canal Historical Park, being closely connected physically as well as from a use standpoint, are under increasing risk of "overuse" by people fishing, boating, canoeing, powerboating, waterskiing and other recreational activities. There is always a problem of balance, *i.e.*, when does it become important in the public interest to deny some people use of these publicly supported facilities in order to maintain the resource for future generations, as well as permit enjoyment for the luckier portion of the public who manage to use the facilities within the use limitations.

I assume this is a problem common to all national park properties, but I do not recall that I have seen the problem of "overuse" discussed in the scientific setting, *i.e.*, water pollution, noise, danger to the environment, etc.

Carl Shipley, Member
C & O Canal National
Historical Park Commission
Suite 820
910 – 17th St. NW
Washington, D.C. 20006

Editor's Note: For a full accounting of meetings of interest, see also Fall 1984 and Winter 1985 issues of Park Science.

MEETINGS OF INTEREST

1985

April 27-28, NEW YORK STATE FOREST PRESERVE CENTENNIAL SYMPOSIUM, marking the 100th anniversary of establishment of the Forest Preserve, which encompasses 3 million acres of wild forest land in the Adirondack and Catskill Mountain regions of New York, to be held at Union College in Schenectady. Co-sponsors are the Adirondack Mountain Club and the Adirondack Research Center. Contact: NYS Forest Preserve Centennial Symposium, c/o ADK/ARC Organizing Committee, 172 Ridge St., Glens Falls, NY 12801.

April 30 - May 2, GRIZZLY BEAR SYMPOSIUM, to provide a forum where recent information can be presented and made available to managers. Proceedings will be published. Contact Glen Contreras, USFS, 324 25th St., Ogden, UT 84401, 801/625-5664.

June 7-9, ANNUAL MEETING AND SCIENTIFIC CONFERENCE OF THE GREATER YELLOWSTONE COALITION, at Lake Hotel, Yellowstone NP. Contact: Bob Anderson, P.O. Box 1874, Bozeman, MT 59771, 406/586-1593.

July 23-26, NATIONAL WILDERNESS RESEARCH CONFERENCE, an interdisciplinary meeting at Colorado State University, Fort Collins, to integrate and interpret what has been learned by the scientific community related to wilderness resources and their human uses. Topical areas included are air, water, vegetation and soils, fish and wildlife, fire, use and user characteristics, wilderness benefits, visitor attitudes and behavior, and visitor management concepts and tools. Contact: National Wilderness Research Conference, College of Forestry and Natural Resources, Colorado State University, Fort Collins, CO 80523.

*NAPAP Conference/Workshop at Olympic National Park

*National Acid Precipitation Assessment Program. You may have missed it! Such small events have a way of failing to attract the attention of folks involved in national programs or disciplines not directly affected by "acid rain" studies. But maybe you "need to know." If so, here is your opportunity to get up to speed on watershed-level studies of the effects of acid deposition at Olympic National Park.

A conference/workshop was held on December 18-19, 1984, to bring together investigators involved with research on acid precipitation effects, nutrient cycling, and air and water quality monitoring. The objectives of the conference were to provide a forum for sharing information among researchers, and to present information to managers. The workshop was intended to facilitate better coordination of research efforts among scientists from different institutions, agencies, and academic disciplines.

Conference topics included: (1) Research on air quality of "clean air" arriving across the Pacific Ocean; (2) A global air quality monitoring and research program; (3) Establishment of a baseline for wet deposition and nutrient cycling in a clean area of Olympic National Park; (4) Monitoring litter decomposition rates and primary productivity of selected lichens and mosses; (5) Small mammal species survey; (6) Nutrient cycles and carnivore utilization of salmon carcasses on two small watersheds; and (7) Heavy metals in selected plant species (a lichen, *Allectoria sarmentosa* and subalpine fir, *Abies lasiocarpa* of the Olympics and Mount Rainier).

The workshop following the presentation proved fruitful. Discussions (sometimes lively) helped clarify roles of different investigators and pointed up some of the shortcomings of the project. Some shortcomings

can be resolved through additions to the program, but generally budget limitations will prevent addressing all issues. The baseline database established within the park will prove extremely useful in the future as acid precipitation becomes of increasing importance.

A "proceedings" publication is planned and will be announced in a later edition of *Park Science*. In the interim, feel free to contact either John Aho or Dr. Ed Schreiner at Olympic National Park (206) 452-4501 (FTS 396-4241) to learn more.

Wilderness Management Course

A summer course in American Wildland Management will be offered June 10 through 22, 1985, by the Mountain Research Station of the University of Colorado. The course will be full time – the first half based at the Research Station in the Colorado Front Range; the second half comprised of field work in the Grand Teton, Yellowstone area. Dr. Kenneth Barrick of the University of Alaska, will be the instructor. Included will be an intensive survey of the ecologic and economic principles related to wilderness management.

For information on this course and others in the environmental science field (Principles and Dynamics, Field Techniques in Environmental Science, Alpine and Subalpine Field Ecology, Field Research in Ecological Theory, and Rocky Mountain Flora), write Dr. Mark Noble, Mountain Research Station, Institute of Arctic and Alpine Research, University of Colorado, Nederland, CO 80466.

Peregrines Return to Acadia

By Carroll Schell and Ann Kozak

Acadia National Park is one of several national parks east of the Mississippi River where peregrine falcons (*Falco peregrinus*) nested historically. Peregrines have been sighted on at least two cliff faces in Acadia – Champlain Mountain and St. Sauveur Mountain. The last documented nesting effort occurred in 1956, and this 28-year lapse in active nesting sparked our interest in participating in the captive breeding and release efforts of the Peregrine Fund.

The Peregrine Fund was established in 1970 and has facilities at Cornell University in Ithaca, NY; at Fort Collins, Colo., and at Santa Cruz, Calif. Although the peregrine falcon at one time nested extensively on cliffs throughout North America, by the 1960s the birds were virtually extinct. DDT, ingested through their food, caused the falcons to lay eggs with thin, weak shells. Before the eggs were ready to hatch, the shells broke. When the U.S. Government finally banned DDT, not a single peregrine falcon remained in the eastern United States. By contacting individual falconers and asking them to donate peregrine eggs and by developing successful techniques for raising the birds in captivity, Peregrine Fund biologists were able to begin releasing young falcons at approved sites. Slowly the peregrine falcon is being reestablished. In 1984, 124 falcons were released in the eastern United States by the Cornell program. Only four were lost to great horned owls or impact injuries.

With the cooperation of the North Atlantic Region's Office of Scientific Studies, the State of Maine, the U.S. Coast Guard, the College of the Atlantic (Bar Harbor, Maine), the U.S. Fish and Wildlife Service, and the Peregrine Fund, we successfully launched our project. During the spring of 1983, Dr. William Drury of the College of the Atlantic was commissioned to conduct a feasibility study of releasing peregrine falcons in Acadia NP. In addition to providing an historical overview of falcon nesting on Mount Desert Island, the study assessed the feasibility of establishing, or "hacking," peregrines at five sites within the Park's boundaries.

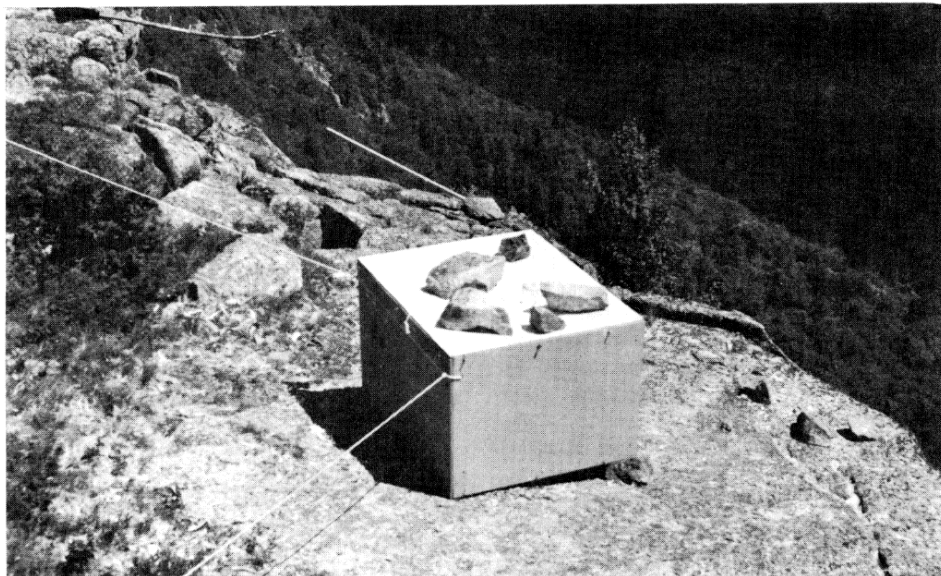
The two historical eyries were immediately dropped from the list due to concern for conflicts with visitors and the low potential for natural nesting in both areas. To determine which of the three remaining sites would be the safest and most appropriate, Peter Duley, a student at the College of the Atlantic, began to call for great horned owls, a major predator of young falcons and the principal concern of the Peregrine Fund. Using a tape adapted by Drury from the Peterson field guide records and a commercially obtained tape by Johnny Stewart, we continued to call through March and had only one positive response from owls. At the preferred site – Jordan Cliffs on Penobscot Mountain – no response was elicited.

Following a meeting in Sept. 1983 with State and University of Maine officials as well as representatives from the U.S. Fish and Wildlife Service and the Peregrine Fund, Acadia was designated the best site in the state. Two additional sites in Maine – Horse Mountain in Baxter State Park and Fletcher Bluff near East Eddington – also were agreed upon. In reciprocation for state cooperation, the Park agreed to construct hack boxes for the other sites from materials furnished by the State. In all, Park personnel built four boxes.

We estimated that to transport the hack box (3' x



The view from Jordan Cliffs, site of the "hacking" operation at Acadia National Park.



The hack box, held in place by ropes and weighted with stones.



Peregrine attendants maintain their vigil on Jordan Cliffs

4' x 5') and camping and monitoring gear to the cliff site in Acadia would take approximately 30 man-days. The Coast Guard, however, had to deliver an air compressor to Egg Rock, an island two miles off the coast of Mount Desert Island and five miles from Jordan Cliffs, and agreed to transport all our gear free of charge. Because of the size of the Coast Guard's helicopter and the physical features of the cliff ledge, our gear could not be delivered directly to the site. Instead, it was brought to the summit of Penobscot Mountain, and five men transported all the gear to the cliff site in one and a half days.

On May 25, 1985, Duley, one of two students from the College of the Atlantic who would care for the peregrine chicks, prepared the site and set up camp for the seven chicks, which had been driven to Acadia from Cornell by Dr. Jack Barclay, Peregrine Fund field biologist. Accompanied by reporters and photographers from the *Bangor Daily News*, the Associated Press and the local press, the seven chicks – 5 female and 2 male – bred in captivity, were carried to the site in canine transport cages by Park and Peregrine Fund personnel. One week later, Marty Gilroy, a Peregrine Fund assistant, arrived at Acadia to supervise the release of the chicks and to monitor their progress as well as our own performance with the project.

On June 7, the chicks were released from the hack box for the first time. One chick immediately flew from the box and was not seen again for a day and a half, and by the end of the second day all seven birds were flying. Six weeks after the chicks were delivered to the Jordan Cliffs site, the attendants began the weaning process. Prior to that date, each falcon chick received one frozen cockerel per day, dropped to the hacking ledge from another ledge above the hack box. When gulls and other larger birds began taking some of the food, the cockerels were tied down by the attendants. After the sixth week, the birds were fed every other day. Park personnel supplied the attendants with ice, supplies and feed for the falcons every three days.

In addition to feeding the chicks and monitoring their progress, the hack site attendants acted as interpreters to hikers who approached the site and also watched for climbers interested in testing their skills on the cliff. Although the Jordan Cliffs hack site was chosen because of its 500-foot cliffs and relative isolation, an occasional hiker did visit the area. The attendants explained that the Park was participating in the Peregrine Fund's release project, and that the birds are an endangered species and somewhat fearful of humans. Frequently they explained what had already occurred in the hacking process, what the chicks ate and how often, and, if the birds were in the vicinity, what their flying skills and techniques were and where one could best view their aerial display.

The young falcons spent approximately one month developing flying and hunting skills, mostly in the vicinity of the hack location. Gradually, their time away from the hack site lengthened and as early as July 3, Maggie, the first chick to fly, was seen for the last time. July 26 marked the last day that any of the seven peregrines were observed at the hack location. After sighting no birds for three days, Duley and David North, the other attendant, broke camp for the 1984 season.

Although releasing the peregrine falcons in Acadia was successful, whether the Park will continue to participate in the program depends on a number of factors. The difficulty in obtaining peregrine chicks is one obvious obstacle. Should a pair of great horned owls move into the nesting area, the Park would either have to find another site or not participate, since the

Two NPS Scientists Speak on Science Role in Parks

The National Park Service's science program will come under scrutiny at two national meetings this spring. Attendants at the 50th North American Wildlife and Natural Resources Conference in Washington, D.C. (March 15-20) will have the opportunity to hear Clifford J. Martinka, senior scientist at Glacier NP, discuss "A New Role for Science in the National Parks." On May 28, as part of the annual meeting in Los Angeles of the American Association for the Advancement of Science, NPS Resource Management Specialist John Dennis will speak on "Building a Science Program for the National Park System."

Dennis will be appearing as part of a panel on "How can science be used more effectively to manage natural resources in national parks?" Phyllis Myers, senior associate of the Conservation Foundation, will moderate the panel.

Also slated to appear on the AAAS panel are Bob Barbee, Yellowstone NP superintendent, and Dave Graber, research scientist at Sequoia/Kings Canyon NPs. Barbee's assigned topic is "From Grizzlies to Geysers: Science Challenges Tradition;" Graber's is "What the Visitor Doesn't See: Restoring Scientific Integrity to Natural Resource Management."

James Teer and Michael Mantell round out the AAAS panel. Teer is director of the Welder Wildlife Foundation and will describe "Why We Recommend a Million Dollars to Study Grazing in Capitol Reef NP." Mantell is a senior associate of the Conservation Foundation; his topic is "The Limitations of Science:

Peregrine Fund biologists consider the owl a major threat to the success of the reintroduction program. Another problem involves the effect the reintroduction of peregrine falcons will have upon the tern population. Approximately 175 pairs of common terns nest on Egg Rock, as well as occasional arctic and roseate terns, and terns are common prey of falcons. A dramatic decline in Maine's coastal tern population already has occurred due to the invasion of tern habitat by gulls, and a further decline in the tern population could be triggered by the falcon reintroduction. In any event, a continuation of the falcon release program undoubtedly will require additional monitoring of the tern population.

The principal factor preventing Acadia's participation, however, involves the peregrine falcons themselves. According to Barclay, the whole purpose of the hacking program is to imprint the nesting site on the young birds. The falcons raised in 1984 on Jordan Cliffs may have imprinted that site, and in two years when they are ready to mate, they could threaten any young chicks being hacked there, since these young chicks would be infringing on their territory.

Schell is Chief of Resource Management at Acadia NP; Kozak is Writer/Editor at College of the Atlantic, Bar Harbor, ME

Uncertainty, Politics and Values in Managing Park Resources."

Abstracts of Martinka's and Dennis's presentations follow:

Building a Science Program

National Park System resources are preserved for use of current and future generations of people. National Park Service experience in preserving while providing for use demonstrates the value of scientific information for decision-making. The NPS natural and social science program began in the 1930s from private funding. After a period of minimal effort, the NPS rejuvenated this program in the late 1960s, decentralized it in the early 1970s and slowly expanded it. Today, the NPS allocates 2.4 percent of its budget and 2 percent of its personnel to natural and social science activities conducted by park, cooperative university unit, central office, other government, or contracted scientists. These activities provide extension services, informal reports and formal research papers on topics ranging from applied, specific resource component questions to long-term, ecosystem questions.

The integration of science with park management through park resource management plans and the linkage of scientists with resource managers provides the program's strength (because science is directly part of decision-making) and its potential weakness (because scientific independence is at risk). The building of NPS science for the future seeks to maintain the strengths and minimize the weaknesses so that the NPS can respond to the ever-increasing human ability to manipulate natural ecosystems and the increasing pressure that the sea of human development exerts on the islands of naturalness that are the parks.

John G. Dennis

New Role for Science

Conservation of natural ecosystems is generally considered to be a primary mission of national parks. Scientific knowledge has played an increasingly important role in the management of natural resources within parks. Science programs expanded rapidly during recent decades and are currently integral to many national park organizations. Descriptive studies and management experimentation have been primarily related to park missions. Results have pointed to solutions for many park problems but also have emphasized a need for research that includes adjacent lands.

An improved understanding and potential for mitigation of external influences are distinct benefits of regional research packages. In turn, regional resources benefit through the availability of baseline information against which exploitive practices can be compared. Parks are thus in a position to provide a rationale for wise use of natural resources on a regional basis.

This emerging role for park science may be expected to elevate the value of parks, with science ultimately assuming a position commensurate with resource conservation and visitor enjoyment in park missions. The new role will require an emphasis on research design, interagency teamwork and long-term continuity of data collection.

Clifford J. Martinka

Politics as it Relates to Research and Resource Management in National Parks*

By William H. Ehorn, Superintendent
Channel Islands National Park, California

An often forgotten and overlooked element in doing research and resource management in national parks is politics and its influence on the results and outcome of these two extremely important programs. It is very clear to me that our resource management problems are becoming more complex than ever before and the public and politicians are more involved in all research and resource management actions that are undertaken in our national parks. It is also apparent that we can't afford to be doing research for "research's sake," it must be applied and related to management needs. Instead of our resource management needs becoming easier, they are becoming much more difficult to accomplish than they were 10-20 years ago. The political climate continues to affect our mission to restore these national treasures to the way they were prior to European man's presence.

Politics as it relates to resource management and research has several factors which need to be considered by both our scientists and managers. Before discussing these factors, I'd like to offer my definition of politics as it relates to these programs.

"Politics in research and resource management is the art of building a constituency for overall park management and support for research and resource management actions."

What I mean by this is, that the public needs to be constantly and consistently dealt with and consulted about the purpose and importance of our national parks. An excellent public relations program is necessary to sell the park and all its management programs. This needs to be done on all levels (local, regional, state, national and international). Once the public becomes aware and understands our mission, it becomes easier to accomplish our research and resource management objectives. The factors that need to be considered in any research and resource management actions are as follows:

Must have scientific and professional consensus as to facts (management without knowledge is a dangerous policy).

Both the scientist and manager need to consult with peers in the local communities to seek concurrence and support. It may be necessary to consider a scientific committee to provide additional advice and support. This, of course, depends on the magnitude of the problem at hand.

Superintendents need grassroots support from local towns and counties, and support from regional, state and national levels if necessary.

This depends upon the sensitivity of the problems. For example, if one were to remove exotic rats from

an area, the public would not necessarily become aroused, or even care, since not many people see rats as beneficial. On the contrary, if you were to propose removal of sheep, burros, or perhaps rabbits at Easter time, you could have a real public relations problem confronting you. This is where that support and that scientific advisory committee will help. Again, it depends on the sensitivity and popularity of the non-endemic plant or animal to be eradicated. A manager or scientist can never have too much public support in the carrying out of resource management actions.

Managers and researchers need to be well organized (they should have clear objectives, good strategy, good flow of information so people who need to know are kept informed).

Once you are well organized with a clear set of objectives and strategy, this information needs to be communicated to the public and especially to any special interest groups. In some cases those persons who you know will definitely oppose your actions need to be communicated with head-on. It's surprising that sometimes you can reach a satisfactory understanding, but at other times you may not. However, you must not get discouraged even though they continue to disagree; you must continue with an action proposed as long as you have met all of the legal requirements, i.e., Congressional mandates, NEPA, and NPS policies, etc.

I also feel it's important to realize that people and groups, including your own staff, may not receive the information in the same way. Therefore, plan your presentations for the diversity of audiences with whom you need to communicate. Try to meet with the most concerned and interested groups on their turf so they are more relaxed and don't feel threatened. It also indirectly tells them you really care and honestly want their support and understanding.

Special efforts are necessary in soliciting support from influential people and respected scientists.

Scientists and managers in parks know there are key persons who are influential in the universities, natural history museums and the surrounding communities. A special effort is needed to solicit their total support prior to communicating your proposed resource management actions to the general public. It's surprising how much help these people can be in selling your program. Even more importantly, these people can offer an incredible amount of good advice and come to your aid with support should you need it during the actual manipulative resource management actions. Again, it can also be useful to bring these influential people into an organized advisory committee to help you in the planning process.

Define your vocabulary so it's well understood – don't get the public unduly alarmed by using terminology they don't understand.

Managers and scientists must realize the information they wish to get out to the public will need to be prepared in different terminology for different interest groups. The vocabulary you use to talk to a group of scientists will not be the same as that prepared for the local chapter of the National Rifleman's Association. It is also important that you analyze the phrases we use, such as "Management Alternatives," "Planning Concepts," etc. These types of phrases are confusing.

It has been my experience that in the public's mind, all of the alternatives and any concepts presented are the plan. We need to make it clear as to what our recommendations are without clouding the issues with all the alternatives we considered. Other words to be aware of in resource management actions are "eradication" or "elimination" – it's much better to use "control techniques."

Managers need to know the problem first-hand; touching and feeling it lends credibility.

This is probably one of the most important factors to be considered by managers. They need to get out in the field and see the problem and understand it fully by teaching and feeling it before taking any action. This will help to build support with the scientists and the public as well.

Politics may dictate a piecemeal approach to solving the problem.

Often times, the magnitude and complexity of the problem and the political environment may be such that the research and resource management actions will have to be planned to take place over a long period of time or when the political climate becomes more conducive to NPS objectives. Examples would be the phasing out of commercial fishing or hunting within a park. These are sensitive issues. First, the research must be done and the data collected must clearly demonstrate the degrading effects to the natural ecosystem that these activities are having. The second step may be to make a recommendation to phase out commercial fishing in one small study area that can be used to compare other areas with, eventually leading to total elimination over a long period (a grandfather clause). This is especially true when other agencies or jurisdictions are present.

Be committed and have guts.

Once the necessary scientific data have been collected and the legal requirements met (NEPA, EPA, Legislation, etc.) concerning a research and resource management problem, the manager needs to implement the plan. You will not always have total support, but a manager should be committed to carry it out. According to NPS policy and legislation, it is against the law not to take a resource management action especially when that action involves an exotic species having a dramatic impact on the resources for which the park was established. A further word of advice would be to avoid making the problem larger than it really is. Get started doing something and be persistent.

All of the above factors involve a great deal of effective timing and politics and must be considered in every step of the resource management and research programs in the preservation and protection of our national parks.

**Adapted from an address presented at the Second Biennial Conference on Research in California National Parks held at the University of California, Davis, in September 1984.*

regional highlights

Alaska Region

A 33-page *Bibliography of Research and Exploration of Glacier Bay, Alaska, 1798 to 1984*, focusing on Glacier Bay National Park and Preserve, Gustavus, Alaska, has been published by the NPS Science Publications Office, 75 Spring St., S.E., Atlanta, GA 30303. Compiled by Doris Howe, the bibliography provides research and exploration references that are as up-to-date as possible at the time of printing (September 1984) in five main subject areas: geology, glaciology and climatology; terrestrial ecosystems; history and anthropology; marine and aquatic ecosystems, and resource management.

The intent is to update the bibliography on an annual basis and distribute the yearly updates to interested persons. Copies may be obtained by writing to Glacier Bay NP&P, Bartlett Cove, Gustavus, AK 99826-0120.

Southeast Region

Peter S. White, research biologist at Uplands Field Research Laboratory, Great Smoky Mountains NP, was selected to give the Roger E. Wilson Memorial Lecture in Biology at Miami University in Ohio this winter.

* * *

The following publications are now available upon request from Jim Wood at Southeast Regional headquarters:

Proceedings of a Workshop on Unobtrusive Techniques to Study Social Behavior in Parks (John D. Peine, ed.);

Research/Resource Management Report SER-68, *Great Smoky Mountains NP Hard Mast Survey; An Evaluation of the Current Survey, Analysis of Past Data, and Discussion of Alternatives for Future Surveys* (by N.S. Nicholas and P.S. White);

R/RM Report SER-69, *Vegetation Response and Regrowth after Fire on Cumberland Island National Seashore, Georgia* (by Kathryn Louise Davison);

R/RM Report SER-70, *Southern Appalachian Lichens; an Indexed Bibliography* (by Paula DePriest);

R/RM Report SER-71, *The Southern Appalachian Spruce-Fir Ecosystem: Its Biology and Threats* (by P.S. White).

Mid Atlantic Region

Three workshops "with something for everyone" are set for May at the Pocono Environmental Education Center (PEEC) in Dingmans Ferry, PA. (PEEC was established in 1972 and is managed by Keystone Junior College in cooperation with the National Park Service. It is the nation's largest environmental education center with residential facilities.)

May 3-5 will be Warbler Weekend, an offshoot of the popular Hawk Watch weekends; May 10-12 will feature a nature photography workshop, and May 24-

27 will be a four-day weekend focusing on skills (both classroom and field work) for identifying popular plants of the Poconos. Various uses of wild plants will be featured, ranging from artistic to culinary and horticultural.

A three-day workshop in March centered on acid rain and associated issues. Keynote speakers from EPA, the Acid Rain Foundation, and Lehigh University, led small workshop sessions on the causes and effects of acid deposition and methods for teaching this material in the classroom.

Water Resources Lab

From Judith Wilson, NPS Water Resources Field Support Laboratory editor, come two new reports: *Portable Kits for Water Chemistry Reconnaissance in the Field* and *Specific Conductance and pH Measurements in Surface Waters: an Introduction for Park Natural Resource Specialists*. The former is WRFSL Report No. 84-2; the latter, WRFSL Report No. 84-3. Both may be ordered from the lab, Colorado State University, Fort Collins, CO 80523.

Midwest Region

In response to documented impacts of deicing salt runoff from a salt storage area along the Indiana Toll Road on vegetation of Pinhook Bog in Indiana Dunes National Lakeshore, a study of the effects of NaCl on one of the prominent bryophytes of the bog was initiated, resulting in an article by Douglas A. Wilcox, Indiana Dunes NL water resource specialist, in *Environmental and Experimental Botany*, Vol. 24, No. 4, pp 295-304, 1984. Work with laboratory cultures suggested that chloride was a stronger growth inhibitor than sodium. Salt concentrations between 300 and 1500 mg/l as Cl significantly reduced growth in length of *Sphagnum recurvum*. Where water contact was reduced and evaporational plant surfaces increased, salt was deposited on plant tips through the evapotranspiration process, resulting in plant mortality at all NaCl concentrations tested. Washing of plants to simulate rainfall removed the salt encrustations, but they developed quickly again and produced similar lethal effects within 3 weeks of the last wash treatment.

Western Region

A study of the distribution, population size, and habitat response of the Palila (*Loxioides bailleui*) in the subalpine woodland on Mount Kea, island of Hawaii, appeared in the October 1984 issue of *The Auk*. Charles van Riper, III, leader of the NPS/CPRU at University of California, Davis, is one of the authors. The study indicated that the most effective management strategies would be removal of feral ungulates and certain noxious plants from Palila habitat and the extension of the woodland zone to areas now grazed intensively.

Channel Islands National Park hosted a meeting of the Steering Committee of the National Science Foundation's Long Term Ecological Research (LTER) Sites Jan. 21 and 22, 1985. In addition to regular business, the meeting included a discussion, led by Gary E. Davis and David J. Parsons of NPS, of the long term research programs at Channel Islands and Sequoia-Kings Canyon NPs. The LTER managers were encouraged by and supportive of the two programs, and devoted a significant part of their discussion to means for developing a relationship with research programs outside the 11 official sites. There also was a good deal of positive feedback on their hearing of the Park Service's commitment to long term data bases and research. The meeting was organized by Jerry Franklin, USFS research scientist.

* * *

A two-day meeting in January, jointly organized by Sequoia-Kings Canyon NPs and the California Air Resources Board, brought together approximately 60 scientists and technicians who are working in the parks or on related projects to discuss the parks' long term acid deposition/integrated study (highlighted in the Winter 1985 issue of *Park Science*). The meeting featured presentations by the key principal investigators and group discussions on the project and related studies. According to NPS Research Scientist David J. Parsons, the meeting was "extremely successful in achieving its objectives of reviewing ongoing research and planning for future integration." Participants included representatives from USGS, USFS, five University of California campuses, Arizona State University, NASA, the Electric Power Research Institute, and the California Department of Fish and Game.

* * *

A comprehensive treatment of the "10 Most-Wanted" management actions for terrestrial Hawaiian ecosystems survey - conducted following the June 1984 Symposium at Hawaii Volcanoes NP - appeared in *Elepaio*, Journal of the Hawaiian Audubon Society, under the joint by-line of Charles P. and Danielle B. Stone.

The article describes the response (47.9% of the 144 contacted people) and presents their recommendations in tabular and graph forms. As a contribution to understanding differences in the way people look at natural resource problems, the authors subdivided the respondents according to their affiliations and analyzed ratings of the 10 most-wanted management actions. These findings are followed by a discussion section that pinpoints "communication, cooperation, and prioritization" as pathways needing more "organized emphasis."

The article lists, in an Appendix, a letter from Ronald L. Walker, wildlife biology program manager for the Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife. Walker responds to each of the 10 suggestions, all of which he finds "reasonable to the extent that, if implemented, they would have direct benefit to the protection of Hawaiian ecosystems." However, he goes on, "from a practical standpoint we have reservations about their feasibility in view of socio-economic realities."

The Stones' article proposes a "goal-oriented 'blue ribbon' Advisory Committee . . . to deal with recommending and publicizing land use priorities, approaches and responsibilities . . . the committee to be 'resurrected under the initial leadership of the Department of Land and Natural Resources."

Pacific Northwest

"Managing People in Parks and Forests" is the title of a weeklong workshop to be held April 1-5 at Oregon State University under the joint aegis of the National Park Service, the USDA Forest Service, and the OSU Resource Recreation Management Department. Don Field of the OSU/CPSU, will direct the workshop, the focus of which is on how to manage people in recreation settings and the use of social science statistics in the decision-making process. The objective is to provide the foundations for looking and planning for the decade of the 90s. Faculty for the workshop will come from the University of Washington, the University of Idaho, Utah State University, OSU, the USFS Pacific Northwest Forest and Range Experiment Station in Seattle, the USFS Intermountain Forest and Range Experiment Station in Missoula, Mont., and Colorado State University. The conference fee of \$250 includes all materials and the opening dinner.

* * *

"An Analysis of Cruiseship Passenger Characteristics, Activity Patterns and Evaluation of Recreation Opportunities in Southeast Alaska," by Barbara A. Koth, Donald R. Field, and Roger N. Clark is now available at CPSU/OSU 85-2, a publication of the National Park Service's Cooperative Park Studies Unit at Oregon State University's College of Forestry, Corvallis, OR 97331. The 125-page study summarizes cruiseship travel in Southeast Alaska in 1979, a year when the number of travelers and cruiseships in the region represented a high point. This first industry-wide survey for Southeast Alaska provides a data base for monitoring change during the Eighties.

* * *

An unpublished report on mountain goat investigations conducted in 1983 at Olympic National Park is available now, from the park, to park scientists and their collaborators. By the end of March, ONP scientists expect to have available another unpublished report, summarizing all the work done in this area from 1981 through 1984.

* * *

The NPS Cooperative Park Studies Unit at Oregon State University now has available two publications – the *Annual Report for 1984* (CPSU/OSU 85-1) and a four-page brochure entitled *Cooperative Park Studies Unit* (CPSU/OSU 85-3). The *Annual Report* describes the wildlife and aquatic biology programs, the social science program, and the editorial services available through the Unit. It also includes summaries of the research projects, summaries of science applications, a round-up of 1984 publication activities, and a cumulative list of publications, theses, and CPSU reports from 1976 (when the Unit was established) through 1983.

* * *

A 308-page volume, comprising the *Proceedings of the Olympic Wild Fish Conference* held in March 1983 at Olympic National Park, has been published by Peninsula College, 1502 E. Lauridsen Blvd., Port Angeles, WA 98362.

Edited by Douglas B. Houston, research biologist with the NPS Pacific Northwest Region, and J.M. Walton, of Peninsula College's Fisheries Technology Program, the publication contains the 35 papers presented in the following areas: Genetic differentiation of wild fish stocks; Lake studies and management strategies; Agency management of wild fish stocks;

Cutthroat trout; Salmon; Steelhead; and Perspectives.

Copies of the *Proceedings* may be had from Peninsula College for \$15 each.

Wilson's Creek NP Featured

Two stories about Wilson's Creek National Battlefield in Missouri – one dealing with eradication of non-native plant species that now cover the battlefield and the other describing the study of the endangered "bladderpod" (*Lesquerella filiformis* Rollins), appeared in the November 1984 *Courier*.

The prairie restoration program now in its third year is described by Hayward Barnett, seasonal park technician at Wilson's Creek. The fescue, red cedar, and Osage orange are being replaced with native prairie grasses and forbs, a few tracts at a time. The restoration program is now in its third year, with management proceeding according to standard prairie practices. The story describes the series of steps the fields must go through to bring them into native prairie – annual hay harvest, fertilization, and alternate seeding in summer and fall with wheat and sorghum/sudan/crossgrass mixture. Following the third year of this cycle, the fields will be seeded with a mixture of typical prairie grasses and forbs such as big and little bluestem, Indian grass, switch grass, coneflower, purple prairie clover, and sunflower.

The bladderpod is on the Missouri endangered species list and is a candidate for listing by the U.S. Fish and Wildlife Service. A population of bladderpod was found along the walking trail on historic Bloody Hill in the park and a special use permit was issued to the Missouri Conservation Department for a three-year study. The field work in 1984 is described by Lori Leitle, park technician at Wilson's Creek. According to Leitle, cooperation between NPS and Missouri Conservation Department personnel on this effort to ensure survival of the bladderpod has been so successful that future projects now are planned.

Water Resources Branch Organization Defined

A recent (Dec. 19, 1984) memorandum from the Associate Director for Natural Resources to NPS Regional Directors defines six principal issues around which the NPS Water Resources Branch program and funding support is developed:

- (1) Identification and mitigation of external and internal influences on park water quality and quantity;
- (2) Water resources management planning, as a component of the natural resource management process;
- (3) Location and testing of ground water sources;
- (4) Floodplain and flood hazard delineation;
- (5) Inventory and quantification of water resources and water rights, and
- (6) Acid deposition.

Four functional units, under the direction of Water Resources Branch Chief Tom Lucke, are Applied Research, Ray Herrmann, chief; Water Services, Mike Whittington, chief; Water Rights, Stan Ponce, chief; and External Affairs and Planning, Dan Kimball, chief.

Herrmann, Whittington, and Ponce are all located at Federal Building, Room 343, 301 S. Howes St., Fort Collins, CO 80521, and can be reached at (303) 221-5341. Kimball is at 11011 W. 6th St. – AIR, P.O. Box 25287, Denver, CO 80225, and is at (303) 236-8765.

NPFLORA Data Base Expands to 110 Parks

A total of 76 natural area parks in the National Park System now are in the NPFLORA data base and 34 more have been designated for entry in 1985 according to the 1984 NPFLORA Status Report, prepared for the Air and Water Quality Division of NPS by Gary Waggoner, Botanist with the NPS Geographic Information Systems Unit in Denver.

During FY 1984, the NPFLORA data base coverage was enlarged from 45 Air Quality class I units to 76. According to James P. Bennett, Research Branch Ecologist with the Denver Air and Water Quality Division, the parks to be entered in FY 1985 were selected from a master list of all NPS units and their natural features, compiled by the Division.

Out of this list of possibilities, 140 were found to contain natural features and ecosystems of self-sustaining size and thus deserving of inclusion in NPFLORA (for botanical reasons). From the 140, Bennett explained, a roughly even selection of parks was chosen from each NPS Region. Alaska was not included, he said, because of uncertainty about checklists and floras and because of presumed absence of air pollution threats. Waggoner indicated that the presumed presence of air pollution threats was a major factor in selection of the parks that will go into the data base in 1985.

NPFLORA currently has data on 48,995 park occurrences of 12,907 plants. Information on approximately 1,948 new plants was added to the data base. This represents 46 percent of the total vascular flora of North America, Hawaii, and the Caribbean. However, and more importantly, over half (54%) of the native flora is represented in the 76 NPS units (10,514 taxa of a possible 19,530). Ninety percent of the vascular plant families and 71 percent of the genera are represented in these NPS units.

Two Class I units, Crater Lake and Yosemite, are not yet included in NPFLORA. Therefore, the figures presented for Class I areas are approximate and will change once the data for these parks are entered. Tables for the 76 Class I areas include a "completeness estimate," (ranging from well known to poorly known in a five-step rating), total taxa, introduced taxa, and undetermined taxa. Plants endemic to the various designated Regions also are totaled, and the numbers and percentages are given for those that are protected in the 76 NPS units.

The NPFLORA data as of November 1984 for the 19 NPS Biosphere Reserves, show the following total of vascular plant taxa known to occur in these units:

Big Bend NP, 998; Big Thicket National Preserve, 1,205; Channel Islands NP, 382; Congaree Swamp NM, 327; Denali NP and Preserve, 615; Everglades NP, 942; glacier NP, 1,258; Great Smoky Mountains NP, 1,483; Haleakala NP, 545; Hawaii Volcanoes NP, 570; Isle Royale NP, 690; Roatak National Preserve, no data; Olympic NP, 1,344; Organ Pipe Cactus NM, 517; Redwood NP, 630; Rocky Mountain NP, 972; Sequoia and Kings Canyon NPs, 1,331; Virgin Islands NP, 771; and Yellowstone NP, 1,101. (Some of the lower figures represent a lack of adequate knowledge of a park's flora.)

Pressured Meadow Given New Lease

This is a story of a lovely mountain meadow that caved in under the pressure of too much visitor appreciation – a meadow that was “withdrawn from service” and allowed to recover – a meadow that was gently eased back into usage, but with a difference!

The story begins in the winter of 1972-73, when the NPS Washington Office ordered the development of management plans for backcountry use in all national parks having potential wilderness areas. At that time, Mount Rainier NP already had recognized the need for a coherent backcountry management plan and was independently developing one to deal with such impacts.

The star of this story is known as Indian Henry's meadows, and the history of camping at this Mount Rainier site goes back to the earliest days of the park. The meadows are lovely, flower-filled, and inviting. The views they afford of Mount Rainier are unsurpassed. Fifty years ago, a public shelter was built in Indian Henry's subalpine meadows, and campsites were selected in the vicinity of the shelter without major management controls.

In the late 60s and early 70s, park management began to note serious deterioration of the shelter, bare ground impacts around the sites, vandalism, expansion of social trails, the scars of many campfires, and other common user impacts.

The first backcountry management plan for Mount Rainier NP was published in 1973. It called for removal of certain shelters, including Indian Henry's, and the removal of associated subalpine campsites. A minimum impact educational program was initiated and still is in effect. A cornerstone of this program was elimination of undesigned camps on trails throughout the park, but especially in subalpine areas.

It took time, but eventually this educational approach gained strong public support. At Indian Henry's, an alternative camp was developed about one mile from the old campground, deep in old growth forest on the banks of Devil's Dream Creek. Despite growing user education and expanding user information on minimum impact camping and the desirability of having alternative camps in hardened areas, visitors contacted indicated a desire, at least among some people, to camp at subalpine sites.

In the autumn of 1983, it was found that rehabilitation of the old campground at Indian Henry's was nearly complete. Some scars remained, but they were healing well with time. Because of that healing process, park management began considering an experimental development of some alternative form of camping in subalpine meadows, to serve those campers who desired that experience. It was decided then, that a technique would be developed that would allow a single party to camp in or near the Indian Henry's subalpine meadows without causing lasting impacts on biotic systems.

Design responsibilities, as well as installation of the experimental site, were given to the park's Natural Resources Planning unit, with a target date of early summer, 1984 for installation of this experimental facility. The site criteria were:

1. It had to be located near the trail, near a good source of water, and near a toilet.
2. It had to assemble and disassemble rather simply, because it is intended that it will be moved from year to year. Its components had to be reasonably lightweight, so that a small

party could erect, or disassemble it in a single day.

3. It had to be large enough to accommodate a single camping party (roughly 100 square feet).
4. Its design would encourage the users not to leave it.
5. The materials used would blend aesthetically with the surrounding environment.

Subject-to-furlough Park Ranger Bob Martin volunteered several weeks to create a sound design package. Bob elected to design a platform composed of six floor panels, elevated on 4 x 4's to be installed 30 to 50 feet from the trail, and made accessible from the trail by the development of a highly portable elevated metal walkway. Design drawings are available upon request.

A 96-square-foot platform was constructed and preassembled in the park's carpenter shop in the spring of 1984, disassembled, and flown with an installation crew of six to Indian Henry's early in the summer. The date and period were carefully selected to provide maximum vegetative and soil protection due to the presence of snow still on the ground and reasonably easy installation due to the absence of most snow at the selected installation site.

Care was taken during installation to further minimize impacts on delicate vegetation by installing the walkway into the site first, carrying the panels to the end of the walkway and bolting them together while standing on half sheets of plywood. Vegetative crushing was expected and noted, but it was reported some weeks later that vegetation had rebounded.

The construction crew erected and put the campsite into operation in a 5-hour work period, then hiked out. The campsite was removed in early October after a killing frost and before heavy snow, by a work crew of 5 in about 3 hours. It is expected that the platform can remain in use for 8 to 10 years and be installed

at different sites each year, to minimize long-term impact.

Impacts created by the platform's installation and removal, as well as by public use, were monitored by the park botanist and by park researcher Dr. Ola Edwards of the University of Washington. The site was photographed before and after installation as well as while in use. Monitoring of the site will continue through October 1985. It was recognized in the planning stage that there would be transitory impacts, but – although a final evaluation cannot be made until monitoring is completed – it is believed by the Mount Rainier staff that impacts were vegetative in nature, of reasonably short duration, and that if the campsite is not used in 1985, very few vestiges of impact will remain.

The total cost, figured at \$3,050, breaks down as follows:

Materials, \$1,100; carpenters' costs for construction, \$400; installation/removal costs, about \$850 exclusive of about 24 volunteer hours; helicopter costs, about \$700. Designing took about 100 volunteer hours.

From its installation on July 27, through Sept. 30, 1984, the experimental platform was used by 18 parties who stayed an average of one night, totalling 44 people, for an average of 2.4 persons per party. At the junction of the access ramp with Wonderland Trail, a sign was posted describing the experiment. A brochure offered the users and passersby the opportunity to comment. A total of 71 responses were received, 16 from users, representing a user response rate of 88 percent.

Observations by at least 3 staff members were that in discussions with upwards of 60 hikers, their verbal response was generally positive.

Backcountry Specialist Peter Thompson of the Mount Rainier NP staff concluded that the objectives



Vegetation shrouds side of walkway at minimum impact campsite southwest of Wonderland Trail.

were met and that the "minimum impact camping" educational program had been successful. "This conclusion is based," he said, "on the comments we received from visitors – they played our program back to us."

If the platform is to be used in the future, he said, it should be moved to a new location annually and that site should be surveyed prior to placements by a subalpine plant specialist.

Thompson recommended that the unit be used on a continuing experimental basis, and that after a second season of use a final evaluation and decision regarding long-term applicability should be made.

"If we could do this job over and take advantage of 20/20 hindsight," Thompson concluded, "we would:

- "1. Paint walkway and platform prior to placements, or make it all of environmentally compatible materials.
- "2. Consider elevating the walkway to a height of at least 10" so vegetation would not grow through the walk and be trampled by users.
- "3. Conceal the site from the trail.
- "4. Redesign walkway to a more aesthetically pleasing type."

Center for Urban Ecology Replaces Ecological Services Lab at NCR

Scientists in the National Capital Region early this year unified services and moved together under one roof in a renovated maintenance facility now called the Center for Urban Ecology (CUE).

Formerly the Ecological Services Laboratory in the teahouse on the end of Hains Point, CUE is now located in the Palisades District of Rock Creek Park in Northeast Washington, D.C. The Regional Chief Scientist has moved his office from NCR headquarters to the new facility along with the plant ecologist, whose laboratory and office were located in Prince William Forest Park, Triangle, VA.

While most of the park area of NCR is wildland, the most demanding natural resource problems occur as the result of man's intervention into natural processes. Scientists at NCR have developed recognized expertise in problems associated with the invasion and spread of exotic plants, animals, diseases and pests; the establishment, evaluation and propagation of native and non-native plants in urban parks; describing, characterizing and developing management strategies for natural and man-influenced soils; and wildlife management in urban settings.

These problems are common among urban parks. Consequently, the experience gained in NCR parks has found application in many other NPS areas as well as in many other Federal and nonfederal parks.

In recognition of this expertise and assistance in managing highly man-influenced parks, Jack Fish, Regional Director selected the Center for Urban Ecology as the name most representative of the new facility.

The formal opening of CUE is expected in mid-Spring 1985.

CUE is located adjacent to the Georgetown reservoir at Elliot Place along MacArthur Boulevard in the Georgetown section of Washington, D.C. The street address is 4598 MacArthur Boulevard, Washington, D.C. 20007. The non-FTS telephone number is (202) 342-1443. The official mailing address will continue to be that of the NCR:

National Park Service
National Capital Region
Center for Urban Ecology
1100 Ohio Drive, S.W.
Washington, D.C. 20242

Managing Wildlife with Experimental Rigor? Why Not?

"Wildlife Management as Scientific Experimentation" – a pseudonymous article in the Winter issue (Vol. 11, No. 4, 1983) came late to *Park Science* attention, but so intriguing are the ideas therein presented that it is reviewed here in some detail.

Under the collective pen-name of John Macnab, four wildlife managers from four different countries, (Canada, U.S.A., Australia and Africa) propose that wildlife management schemes are in reality experiments – that their validity rests on ecological *assumptions* rather than *facts*, and that instead of calling these assumptions by the often misleading name "principles," the management schemes should be set up "with a modicum of logical rigor (that) will test those assumptions."

The authors note that wildlife managers manipulate systems to achieve a management objective rather than to find out how the system works. As a result, little attention is given to experimental controls: "the 'experiment' is often unbalanced, factors are confounded, replication is unusual, and tight hypotheses are rare or absent." If the manipulation fails to achieve the desired effect, the tinkering is modified, the objective is redefined, or the project is "quietly forgotten" – without anyone's having extracted the management insights that such a "mistake" could have furnished. "This is not merely a great pity," the authors state, "but a waste of information."

A more useful, efficient, economical approach to management would involve three prerequisites:

First, that the management treatment be run as an experiment, following the rules of experimental design (controls, replication and balance where needed);

Second, that the assumptions on which the man-

agement action is based be identified and stated as hypotheses;

Third, that the effects of manipulation be measured and the results reported – *particularly* if the outcome is *not* the result that was expected.

"The rejection of a hypotheses is not a disaster, but an advancement of knowledge," says John Macnab.

The article goes on to describe three management treatments that might be used to test ecological assumptions; the first by the use of manipulative management (the harvestable surplus model), the second by the use of custodial management (ungulate dynamics), and the third a combination of the first two (the fence effect).

The suggestion advanced by Macnab is that wildlife management at its best is scientific experimentation and that the major change required is for managers and scientists alike to treat their assumptions as hypotheses. Management treatments could then be tested by use of experimental controls or more than one level of treatment, replication would become a common practice, and rejection of a hypothesis would no longer be viewed as a failure but as a contribution to understanding.

"Inevitably," the authors conclude, "the present distinction between research and management would blur, research and management being forced into a tighter working association. Because the manager would be encouraged to state and test assumptions and to report the results, he/she would be operating on a more challenging professional level. Professionalism is attained not by strident proclamation, but through the quality of the thinking that the manager brings to bear upon the task."

Glacier Bay Symposium Proceedings Available

In September 1983, more than 135 persons from federal and state agencies, academia, independent research institutes and privately pursued projects gathered at Glacier Bay National Park and Preserve for the first Glacier Bay Science Symposium – dedicated to the memory of William Skinner Cooper (1884-1978) and jointly sponsored by Friends of Glacier Bay and NPS.

The occasion itself generated great excitement in the somewhat restricted scientific circle present. Now comes the *Proceedings* of that historic meeting, and the excitement can spread through the printed word.

This well-designed, illustrated, 95-page publication manages to convey the spirit of what was a remarkable blend of scientific fact and human emotion. William E. Brown's keynote address evoked the power and glory of John Muir, John Burroughs, Richard Goldthwait, William O. Field, Donald Lawrence, and even Cooper himself, as the NPS historian traced the majestic impact of "this ancient academy" on the handful of scientists, artist, and humanists who, over the past century, have braved its halls.

The panels and programs covered geology, glacial activity and climatology; terrestrial ecosystems;

marine and aquatic ecosystems; resource management; and the humanities. All the papers are presented in this volume along with the recommendations from each of the science panels. A map of the glacier Bay region and a list of all participants and their affiliations are included.

In a Postscript to the *Proceedings*, the editors describe "the real essence of the First Glacier Bay Science Symposium" as extending beyond the usual scientific objectivities and quantifications. "The prevailing mood of the gathering – among scientists and laypersons alike," they said, "was marked by a deep-seated, mutual concern about the proper relationship of science to the fundamental values of Glacier Bay *the place* and Glacier Bay *the Park and Preserve*. "What is so special about the land and water and life of Glacier Bay?" the editors ask. "What is and should be the character of Glacier Bay National Park and Preserve? What role does science have here?"

The Symposium focused sharply on these questions and the concern is reflected in the pages of the *Proceedings*. Copies may be obtained by writing Glacier Bay National Park and Preserve, Gustavus, AK 99826.

information crossfile

Grizzly Bear Recovery Notes appeared in January 85 with Issue No. 3, an eight-page "update on grizzly bear recovery efforts from the Interagency Grizzly Bear Committee." The status of the grizzly bears is covered for the Yellowstone ecosystem, the Northern Continental divide ecosystem, the Selkirk Mountains, and the North Cascades and Selway-Bitterroot ecosystems. Contact is Dr. Chris Servheen, Grizzly Bear Recovery Coordinator, U.S. Fish and Wildlife Service, HS 105D, University of Montana, Missoula, MT 59812.

The U.S. Forest Service in conjunction with the Interagency Grizzly Bear Committee will host a symposium on grizzly bear habitat and habitat management April 30-May 2, 1985, in Missoula, Mont., featuring invited papers on all aspects of habitat research and management and a poster session. The proceedings will be published. (See Meetings of Interest for details).

The "need for more effective management of the natural resources set aside in our National Park System" is the issue dealt with at some depth in the Conservation Foundation's forthcoming publication, *National Parks for a New Generation: Visions, Realities, Prospects*, slated for Spring 1985 publication.

Acknowledging significant improvements in resource management in recent years, the report will recommend a short-term "crash" program to increase Park Service expertise, to collect needed information and perform research, and to take corrective steps. It discusses some of the budgetary constraints, threats originating outside park boundaries, traditions of visitor use that may run counter to measures suggested by new information, differences in values among diverse constituencies who use the parks, and the limitations of science in providing clearcut answers to management decisions.

The *Wildlifer's* July/August 1984 issue (No. 205) carries an item about a series of new animal telemetry devices that allow frequent recapture of individual animals, enhancing opportunities for new physiological monitoring of wild animals. The devices are micro-computer controlled. Recapture darts mounted in the collar can be triggered by radio-signal or programmed to fire at a specific time on a specific day. The collars weigh as little as 130 grams and can be used on most mammals fox-size or larger. They contain standard location beeper transmitters, controlled by the micro-computer to transmit activity sensor data or status information periodically. Details can be had by contacting CompuCap, Inc., 8437 Yates Ave. N., rooklyn Park, MN 55443, or calling (613) 424-2373.

Social Carrying Capacity is the theme for the most recent issue of *Leisure Sciences: An Interdisciplinary Journal*, co-edited by Donald R. Field and Carlton S. Van Doren. Richard Schreyer of Utah State University is guest editor for the issue.

Articles include an overview of the social dimensions of carrying capacity, an integration and synthe-

sis of 20 years of research, a conceptual framework for determining carrying capability, the evolution, appraisal, and application of carrying capacity in recreational settings, the use of fact and judgment in the search for a social carrying capacity, and a look at the resolved issues and remaining questions in the field.

The issue (Vol. 6, No. 4, 1984) is available from Crane, Russak & Co., Inc., 3 East 44th St., New York NY 10017, for \$7.95.

M.R. Montgomery, columnist for the *Boston Globe*, finds beavers "busy but dumb" in his personally disappointing introduction to nature's little engineers. When they started building their dams in the tony towns that lie between Rts. 128 and 495 around the Massachusetts metropolis, it turned out that "while the beaver may be a superior carpenter and mason, he is a lousy plumber." The beaver's propensity for deepening and widening his pond has caused anguish in yuppie land. First the rhododendron bushes drown, then the basements flood.

"Wildlife agencies . . . can reduce the water level by the simple expedient of sticking a drainpipe through the beaver dam, with the inlet of the pipe some 18 to 20 feet upstream of the dam - out toward the middle of the pond. This causes the beaver no end of anxiety, all of which he alleviates by plugging imaginary holes in the dam, the beaver being unable to imagine that the water is running out of a hole that begins some six beaver-lengths away from the dam."

Research Natural Areas: Baseline Monitoring and Management is the title of the Proceedings of a Symposium in Missoula, Mont., held March 21, 1984, and available now as General Technical Report INT-173 from the U.S. Forest Service's Intermountain Forest and Range Experiment Station, Ogden, UT 84401.

The keynote address, by Jerry F. Franklin, pinpoints three problem areas that could threaten the integrity of the research natural area system: (1) lack of scientific use; (2) inadequate documentation of the research methods and marking of installations in the field; and (3) inadequate management (stewardship) programs. Suggestions are made to remedy these conditions.

Section One of the report is devoted to baseline monitoring; Section Two describes successful monitoring programs; Section Three tackles management problems; Section Four presents the Symposium conclusions and abstracts of the poster sessions.

The *Australian Ranger Bulletin*, published by the Australian National Parks and Wildlife Service, features fire management in the issue that just arrived at presstime in the *Park Science* office . . . despite the fact that it is Vol. 3, No. 1, 1984. In addition to extensive treatment of fire management and facilities for the disabled, this issue announces that the next two issues of *Australian Ranger Bulletin* will focus on (1) hunting and nature conservation, and (2) communicating with the public.

Grazing Phaseout at Capitol Reef National Park is the title of Phase I of the Final Report being prepared by the National Academy of Sciences on contract for the National Park Service. The 42-page document describes the phaseout of grazing provided for in Public Law 92-207 (signed into law Dec. 22, 1971) and the provisions of Public Law 97-341, passed Oct. 15, 1982, which required NPS and the Bureau of Land Management to contract together for the NAS study.

The report describes the natural and cultural resources and their management in the park, the socioeconomic implications of the livestock industry in southern Utah, and the management conflicts between land-use systems and the park's mandated obligation to protect cultural and natural features. In addition, it outlines and schedules what is to be done in Phase II, to finish to study's objectives:

1. to determine the historic and current impact of grazing on the natural ecosystem and cultural resources of the park;
2. to determine the impacts of grazing on visitor use within the park;
3. to evaluate alternatives to grazing within the park, including means to increase grazing carrying capacity on adjacent BLM lands;
4. to determine the economic impact on grazing permit holders and on the local economy, if such permits were terminated, and
5. to include such other information and findings as may be deemed necessary by the Secretary of the Interior.

Chairman of the special committee appointed to this task by the NAS is James G. Teer, who also is chairman of the Welder Wildlife Foundation.

Forestry Research West, a USFS publication out of Fort Collins, Colo., carries in its January 1985 issue news of acceptance by a breeding pair of Bald Eagles of an aluminum tower as a nest site. This "remarkable measure of adaptability in nesting Bald Eagles" was noted in Arizona by Rocky Mountain Station scientists, following the loss first of a nest and later of the tree that had held the nest. The scientists erected an aluminum tripod and topped it with materials from the original nest.

At first the birds used it only for perching and roosting, but later they took up residence and successfully deposited eggs. For details of this study, and its implications for managers, write the Rocky Mountain Forest and Range Experiment Station, 240 West Prospect St., Fort Collins, CO 80526-2098, and request the reprint "Bald Eagle Activity at an Artificial Nest Structure in Arizona."

Field Study: A Naturalist's Guide to Learning in the National Parks is the title of a feature by Judith Freeman in the January/February 1985 issue of *National Parks*. Among the sources listed are the Chihuahuan Desert Research Institute (P.O. Box 1334, Alpine, TX 79831, 915/837-8370; Yosemite Field Seminars, P.O. Box 545, Yosemite National Park, CA 95389, 209/372-4532; Earthwatch Expeditions, 10 Juniper Rd., Belmont, MA 02178, 617/489-3030; Pocono Environmental Education Center, R.D. 1, Box 268, Dingmans Ferry, PA 18328, 717/828-2319; and Peters Valley, Layton, NJ 07851, 201/948-5200.

Tie-ins with the National Parks and Monuments and the research being conducted there are noted. Opportunities range from learning how to understand and teach park-based science to actual participation in on-going research.

EPA Releases Groundwater Protection Strategy

By Dan B. Kimball

In August, 1984, the U.S. Environmental Protection Agency (EPA) issued a National Groundwater Protection Strategy. The objective of this strategy is to provide governmental agencies with a common reference for the protection of the quality of groundwater for drinking and other uses and also the mitigation of groundwater contamination. This strategy focuses on groundwater quality since water quantity and allocation issues are outside the purview of EPA.

The Groundwater Protection Strategy was developed by EPA for a number of reasons. First, since 1950, reliance on groundwater to supply domestic, agricultural, and industrial uses has increased greatly; second, groundwater has been found to be particularly vulnerable to contamination by man-made chemicals, and the public has recently become very aware of and concerned about the problem of groundwater contamination; third, there is a limited scientific basis upon which to make policy decisions with respect to groundwater protection (e.g., limited data on the sources of groundwater contamination, the movement of contaminants in groundwater, and the technologies for groundwater restoration); and fourth, there is a lack of coordination among responsible agencies in dealing with groundwater contamination problems.

The EPA Groundwater Protection Strategy includes five major components as identified below.

1. The primary responsibility for groundwater protection rests with the states. Therefore, EPA will provide support to States for the development of groundwater protection programs. In FY 1985, the EPA will make available \$7 million for this purpose with a minimum allotment of \$100,000 per state. These funds will support the development of state regulatory programs such as permitting and groundwater classification and the creation of groundwater data systems.
2. EPA will address technical and regulatory concerns associated with groundwater contamination from underground storage tanks since present evidence suggests that leaking storage tanks (particularly gasoline storage tanks) may represent a major, unaddressed source of groundwater contamination.
3. EPA will study the need for further regulation of land disposal facilities, including surface impoundments and landfills.
4. EPA will improve its own institutional capability to protect groundwater (e.g., by the establishment of an EPA Office of Groundwater Protection).
5. EPA will adopt guidelines (expected sometime in 1985) for consistency in its groundwater protection programs based on a policy that groundwater protection should consider the highest beneficial use and that efforts should focus on groundwater contamination that would cause the greatest harm. Therefore, the highest priority will be assigned to groundwaters that are currently used as sources of drinking water or that feed or replenish unique ecosystems. To implement this policy, EPA's guidelines will define protection policies for three classes of groundwater, based on their respective value and vulnerability.

Class I: Special Groundwaters are those that are highly vulnerable to contamination because of the hydrological characteristics of the areas under which they occur and that are also characterized by either of the following two factors:

- a) Irreplaceable, in that no reasonable alternative

source of drinking water is available to substantial populations; or

- b) Ecologically vital, in that the aquifer provides the base flow for a particularly sensitive ecological system that, if polluted, would destroy a unique habitat.

Class II: Current and Potential Sources of Drinking Water and Waters Having Other Beneficial Uses are all other groundwaters that are currently used or are potentially available for drinking water or other beneficial use.

Class III: Groundwater Not Considered Potential Sources of Drinking Water and of Limited Beneficial Use are groundwaters that are heavily saline, with total dissolved solids (TDS) levels over 10,000 milligrams/liter, or are otherwise contaminated beyond levels that allow cleanup using methods reasonably employed in public water system treatment. These groundwaters also must not migrate to Class I or II groundwaters or have a discharge to surface water that could cause degradation. (EPA Groundwater Protection Strategy, pp.5-6)

The groundwater protection guidelines will be used by EPA and the states to make decisions on levels of protection and cleanup under existing regulations (e.g., the siting of land disposal facilities, restrictions on the use of pesticides, and standards for hazardous waste clean-up activities); to guide the development of future regulations; and to establish enforcement priorities.

In addition, these guidelines will be incorporated into related EPA programs, many of which have been delegated to the States (e.g., permitting under the Resource Conservation and Recovery Act (RCRA), the Underground Injection Control Program (UIC), the Toxic Substances Control Act (TSCA), the Clean Water Act (CWA), and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA); sewage treatment funding under the Construction Grants Program of the CWA; and cleanup actions under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA or "Superfund"). It should be noted that EPA will provide flexibility to the states in implementing these groundwater protection guidelines; however, state programs must be "no less stringent" than the Federal program.

In regard to the implications of EPA's Groundwater Protection Strategy to the protection and management of groundwater resources in units of the National Park System, it is still too early to determine precisely this strategy's effect. However, some initial observations can be made. First, EPA's Groundwater Protection Strategy focuses protection activities on uncontaminated, high-value groundwaters, which are characteristic of many units of the National Park System. In particular, the strategy's emphasis on protection of Class I groundwaters would appear to offer special protection to important aquifer systems in National Parks (e.g., through the protection of "ecologically vital" aquifers). Similarly, the strategy's requirement to consider groundwater protection in related EPA and state-administered programs would also seem to provide additional protection to groundwaters of park units (e.g., the consideration of improved groundwater protection in EPA's Construction Grants Program for the funding of sewage treatment in small communities adjacent to Mammoth Cave NP where current sewage disposal practices represent a threat to Mammoth Cave's unique groundwater system). In addition,

EPA's commitment to specifically address contamination from underground storage tanks would seem to provide greater protection to groundwater resources at parks from a significant, unaddressed source of groundwater contamination, leaking gasoline storage tanks.

It should be recognized, however, that the ultimate effect of this strategy on groundwaters of the National Park System will be based largely on how the following issues are resolved:

1. How will the Groundwater Protection Strategy actually be implemented by the states (since they have the primary responsibility for protection of the nation's groundwaters)?
2. How will Class I groundwaters be specifically defined and how do Class I groundwater designations relate to groundwaters of National Park units?
3. How will this strategy actually be integrated into other related EPA and state-administered programs? and
4. Although funding for initial program development is currently available, will additional funding be available for implementation and operation of state groundwater programs?

In summary, EPA's Groundwater Protection Strategy represents a clear step forward in establishing a comprehensive strategy to protect the nation's groundwaters. The central thrust of the strategy would appear to provide special protection to important groundwaters of units of the National Park System. How this strategy will actually affect the protection and management of groundwater resources in National Parks will be largely dependent on how EPA's forthcoming guidelines address the groundwater classification process (particularly in regard to the designation of Class I groundwaters) and how this strategy is ultimately implemented by the individual states.

Copies of EPA's Groundwater Protection Strategy may be obtained from EPA's Regional Offices or by contacting NPS' Water Resources Branch in Fort Collins, Colorado (303-221-5421)

Kimball is Chief of the External Affairs & Planning Unit, Water Resources Branch, Air & Water Quality Division in Denver, Colorado.

CROSSFILE Continued

According to Shelby Tilford, director of Earth Science and application for the National Aeronautics and Space Administration, the technology should be available within the next few years to permit scientists from a wide range of disciplines to study the Earth as a single ecosystem.

"We are just getting to the point where this is possible," Tilford said in a Feb. 17, 1985 story in the *Los Angeles Times*.

Tilford is one of about 30 scientists who met early in February at the NASA Jet Propulsion Lab to map strategy for answering questions with profound global implications — questions that have defied efforts to resolve them on a piecemeal basis. The committee of which he is a part was set up two years ago to determine the feasibility of a major effort to study the Earth as a single system. At issue, said Committee Chairman Francis Bretherton, is the survivability of the planet. Bretherton is an oceanographer with the National Center for Atmospheric Research in Boulder, Colo. He describes the earth as a life support system so complex and so dramatically changed by humans that "we may be pushing up against the boundaries that make life possible. . . but we don't know where those boundaries are."

WHR Data System Being Evaluated At Pinnacles NM

By Michael L. Avery and Charles van Riper III

The Wildlife Habitat Relationships (WHR) System is a computerized data base containing habitat, distributional, and life history information on virtually all terrestrial vertebrate species. In California WHR was initiated in 1981 by the Department of Fish and Game (CDFG), and also has been implemented in a number of other states. The WHR System is designed to complement and extend habitat evolution tools developed previously by the U.S. Fish and Wildlife Service, the U.S. Forest Service, and other agencies. The primary goal of WHR is to develop and implement a wildlife habitat evaluation system that provides decision makers with up-to-date information on wildlife habitat capabilities and that aids in predicting the effects of resource management alternatives on wildlife resources.

Included in the California data base is a wildlife habitat classification scheme that recognizes over 40 dominant vegetation types (e.g. mixed conifer, montane riparian, desert scrub). Wildlife species are linked to the vegetation types by specifying size/age classes and canopy closure for the vegetation type of interest (e.g., Red Fir, small tree, open canopy). The habitat relationships model can be further refined by specifying particular habitat elements such as snags, rock piles, springs, etc. In the data base, relative habitat value ratings are assigned to each habitat type and habitat element for each wildlife species based on published literature and professional judgement.

The distribution of each wildlife species is keyed to counties, latitudinal and longitudinal lines, hydrologic units, U.S. National Forests, CDFG regions, and Bureau of Land Management districts. Species notes provide an overview of behavioral and life history information likely to be useful to the resource manager. These narratives and the distribution maps usually are published together in book form.

We feel that where the WHR system exists it can potentially be useful to NPS resource management personnel. For instance, the likely effects on the wildlife community of a prescribed burning program can be evaluated before the burn is implemented. The system can be queried for the appropriate vegetation types (pre-burn and post-burn), and the lists of associated wildlife species expected before and after can be compared to determine those species most likely to be affected by the burning program.

The WHR system also can be useful in inventorying the natural resources of a National Park Service area. We are currently evaluating this application as part of a resource base inventory study at Pinnacles National Monument (NM), near Hollister, Calif. The inventory includes 75 study sites in 9 vegetation types where we are inventorying birds. Other NPS Western Region scientists are working on small mammals, lichens, and vascular plants in this project. The evaluation of WHR has so far involved only comparison of the bird species recorded during our field work, with the list of species predicted to occur there by the WHR system. There was good agreement between the two lists of species, with greater than 80 percent overlap. Additional tests of the system using data from the Pinnacles study are planned. As more field work is

Caves and Canoes:

Managing Cave Resources In a Recreational Park

By Christopher M. White

Editor's Note: The following is an edited version of the paper given by Christopher M. White, Supervisory Park Ranger (Interpreter) at Ozark National Scenic Riverways, Van Buren, MO, at the National Cave Management Symposium at Rolla, MO, in October 1984.

Over eons, the Current and Jacks Fork rivers (located in southeast Missouri) cut into the slowly uplifting dolomite and limestone underlying the area. Water flowing underground slowly dissolved and carved out numerous caves. A tremendous amount of the underground water reappeared as enormous springs, one flowing as much as 200 million gallons a day. Steep bluffs, sharp hills, and rocky soil were a result. Most of the "hills" are actually knobs left from the early streams and rivers. Early man probably followed the rivers upstream to settle the floodplain. Indians settled in several places along the Current where a broad bench made for enough fertile soil to raise crops.

During the Civil War, caves in the area were put to several uses. Powder Mill Cave is reported to have been used for saltpeter production. Hospital Cave got its name when both sides used it for a recuperation facility. Courthouse Cave was used to hide records relating to the town of Eminence. Other caves were used by civilians to hide possessions or themselves as roving bands of quasi-military troops from both sides swept through on periodic raids. Jesse James and his gang are purported to have used several caves for hideouts. These caves are now within the boundaries of Ozark Riverways.

During the late 1890s, extensive cutting of the enormous stands of virgin timber caused a boom period that lasted into the late 1920s. The cutting practices of the time resulted in gravel-choked streams, clogged springs, and the discovery of many of the caves we explore today.

Coinciding with the lumber era was the arrival of the railroads, opening the area to easy access; fisher-

performed and as the "bugs" are removed from the data base, the degree of correspondence between predicted and observed species occurrence undoubtedly will increase.

We feel that WHR systems can be useful to resource managers working in NPS locations throughout North America. Any NP that has not yet conducted a Resources Base Inventory (RBI) can utilize this system to query what wildlife would be expected to occur within the park. However, WHR is not a substitute for first-hand knowledge or on-site experience.

The WHR system also can be utilized by resource managers to assess the potential impact on wildlife of various management decisions they might make. As WHR becomes available to more NPS areas, a Systemwide usage could occur. Moreover, NPS managers who choose to utilize WHR, would put themselves in contact with numerous state and federal agencies and would thus foster more cooperative work with other management agencies.

Van Riper is leader of the NPS/CPSU at U/Cal, Davis; Avery is a post-doctoral assistant to van Riper.

men, hunters and recreationalists took full advantage. People began to notice the scenery; clear streams, big springs, well-decorated caves, and talk began about setting aside the area.

During the 1930s and 40s, the State and U.S. Forest Service acquired cut-over forest land that had been abandoned by the timber companies. The State purchased land along the Current and Jacks Fork rivers at Round Spring, Alley Spring and Big Spring. These were designated as state parks and developed by the Civilian Conservation Corps in the 1930s. Cabins, campgrounds, restrooms, museums, picnic shelters and a dining lodge were built. Branson Cave near Alley Spring also was purchased and developed, with a walkway leading into the cave.

A Corps of Engineers study in the 1940s identified the Current and Jacks Fork rivers as ideal for a dam. Threatened with development, the rivers were the subject of many columns in the regional newspapers supporting the idea of setting aside the rivers under the protection of the National Park Service. In 1955, a serious push began, and after a long series of political maneuvers, legislation was passed in 1964 declaring the two rivers to be part of Ozark National Scenic Riverways. An area one mile long on each side of the towns of Eminence and Van Buren was left outside the Park boundary. Public Law 88-492 specifically mentions both air and water-filled caves (read springs) for preservation.

But in some ways, the job had just begun. Many of the caves in the long, narrow Park boundary were well-known to local residents and had been subjected to much use and abuse. Designation as a unit of the National Park System brought increasing visitation.

There are three categories of cave users. The first is the experienced caver who comes to go caving. Properly prepared, this group has few problems and does little disturbance to the resource. More potential for abuse lies with some local residents. Trips into a cave are often the measure of one's macho image and evidence of such visits is available in the form of broken cave formations and empty liquor bottles. However, not many caves are visited and this impact, although perhaps heavy on a few caves, is not a problem compared to the largest group of users. This third group is the "incidental caver," one whose caving experience is only a small part of the reason to visit Ozark Riverways. Of the incidental cavers, the largest group are canoeists.

In 1973, there were 1.5 million visitors to the Riverways. Of that, 9.7 percent, or 146,000 were canoeists. Ten years later, total visitation was 1.8 million, but the percentage of canoeists had almost doubled - to 16.7 percent, or 303,000. This is important to cave management, since many of caves in the Riverways are easily accessible and/or visible from the river.

Over one-third of the canoeists are in groups of 20 or more. Most use the upper Current on summer weekends. They have little or no formal canoe handling training, have one or two flashlights, and often are drinking copious amounts of beer. It's not unusual in July or August to have 600-800 canoes launch from one landing to float a river the width of five cars parked side by side.

Caves in the Riverways are in dolomite, tend to be

small (400-1,000 feet), and horizontal in development. Over 225 are located within the narrow Park boundaries and their total could be as high as 300. They tend to be wet with a stream or two, muddy, at one time well-decorated, and most have at least a few examples of cave life. Many of the incidental cavers are repeat visitors and the location of many of the popular caves are handed down in canoeists' lore from year to year. So far, very few accidents have been reported and no fatalities.

Cave management at Ozark National Scenic Riverways is reflected in its cave management studies and inventories. Few such reports are known before the 1950s. Several local histories mention caves used for different purposes. However, comprehensive survey was not done until 1965, when J. Harlan Bretz mentions in his "Caves of Missouri," several caves within the Riverways boundaries. Some years later, Jerry Vineyard completed his master's thesis on Devil's Well, a prominent feature in the Riverways. At the same time, the fledgling Missouri Speleological Society was exploring and preparing reports on caves in the area.

In "Report on Ozark Rivers National Monument Proposal" (NPS, 1960), several pages are devoted to the springs and caves of the area. The report notes that some of the caves are "quite extensive and magnificently decorated with dripstone." It goes on to mention Jam-Up and Round Spring caves and the numerous sinks. The karst features of the area were considered important enough to the Monument Proposal to be worth highlighting.

In 1973, Tom Aley, then a hydrologist with the U.S. Forest Service, published "An Approach to Cave Man-

agement." Although he was addressing the adjacent Mark Twain National Forest, many of the problems he wrote of were and are endemic in the Riverways. It was an early attempt at rating caves based on hazards, cave life, etc. In it, Aley also recognized problems with heavy cave use. . . vandalism, trampling, muddy tracks on cave formations and bat disturbance.

Another study important because of its omissions, was "Safety Evaluation of River-Use at Ozark National Scenic Riverways," (Weaver, 1975). In the report, Weaver was to identify "hazardous and potentially hazardous conditions and practices within the Riverways associated with recreational use of the area." Comments were made about launch area problems, injuries and their cause, hiker's problems, etc. No mention is made of caves or any associated problems.

Brief mention of floater problems is found in "Impact of Floaters on Ozark National Scenic Riverways," (Sutton, 1976). Sutton looks at "the effects of floaters on the Current and Jacks Fork rivers of the Ozark National Scenic Riverways." His emphasis was on soil typing and a short study of soil erosion along the riverbank. Under "recommendations," Sutton noted that heavy use of certain cave sites was causing erosion, vegetation deterioration, and soil compaction and recommended several mitigating actions such as construction of boat landings and permanent trails.

Sutton's study, a master's thesis, is the first about the Riverways the author is aware of that mentions man problems associated with caves. No report thus far had touched on resource problems inside the caves. It was four more years before this was dealt with.

In a 1977 report, "River Recreation Research at

Ozark National Scenic Riverways," the problem of "damage and vandalism to natural features inside the caves" is discussed. No mention is made of habitat destruction. The report recommends "site hardening" at popular sites (steps, moorings, etc.) and a "limited amount of resource manipulation." Caves were recognized as part of a floater's experience and some suggestions were made to restrict or lessen impact. This is the first study that attempts to deal with user-related problems.

The Riverway contracted with Tom Aley to do the first cave management study of Riverways' caves. It was completed in 1980. In the first of two comprehensive reports titled "Cave Management Investigations in the Ozark National Scenic Riverways," Aley "evaluated the significance and extent of cave resources within the Riverways, identified the situations and problems affecting cave resources within the Riverways, and assessed 19 caves and complexes of caves and developed management conclusions and recommendations for these caves."

Based largely on cave location reports from the Missouri Speleological Society, Aley visited 19 caves. He gave a brief description of the cave and an inventory of cave life. At the end of each report, Aley includes a set of management conclusions and recommendations. Signing is suggested for most of the caves. One item of special note is the statement that "not much is known about the type or extent of visitation to these and other Riverways caves." Not until the summer of 1985 will this essential study be done. The importance of Aley's report is that for the first time, Riverways' management acknowledge that caves are a resource to be managed along with the canoeists and other recreationists.

Phase II of Aley's report dealt with an additional 60 caves within the Riverways' boundaries. In addition to the Phase I objectives, Aley looked for signs of archeological resources. Of note in his introduction is the statement; "There are probably more caves within the Ozark National Scenic Riverways than in any other National Park Service-administered area in the United States. Based upon our estimates of the number of visitor days of non-guided cave use, total cave use within the Riverways exceeds that which occurs in any other NPS-administered area in the United States."

Although he did not extensively explore all the caves, Aley did produce, in Phase II, an impressive document to guide managers in protecting the cave resources. These reports compiled a great deal of information from different sources and pointed the way for cave management in the '80s.

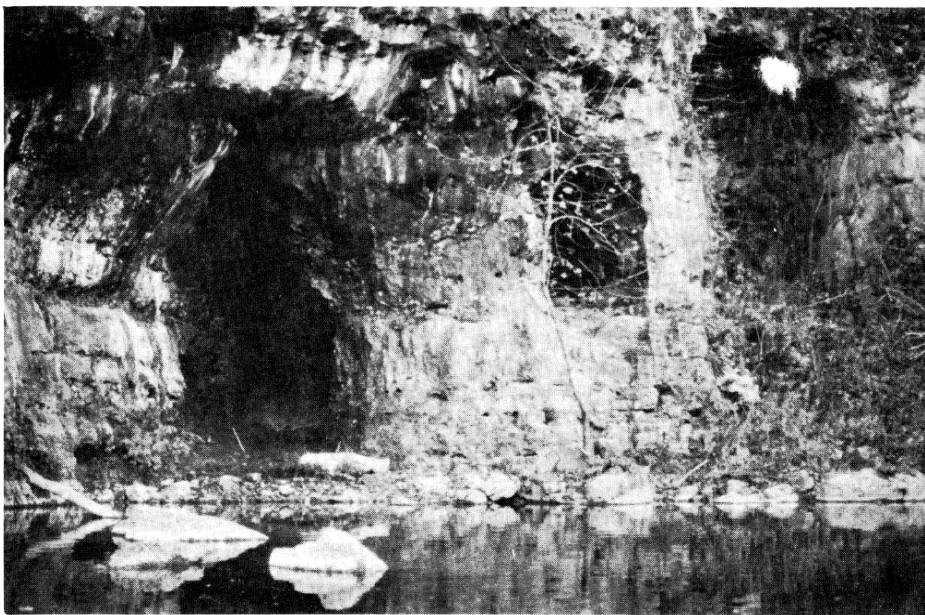
In December of 1981, the Riverways released the Draft General Management Plan (GMP) for the Riverways. Under "Resource Management," a full page deals with caves. It notes that eight are listed as outstanding natural features. The fragile nature and chance for serious injury in caves is discussed. Objectives for caves:

"include the protection of irreplaceable resources while providing for visitor use, promoting appreciation through interpretation, and furthering education and scientific research. The proposed course of action for cave resources is to complete inventories and management plans for all caves, with increased development and maintenance of some for visitor use."

Finally, a brief listing of needs included continuing cave inventories and additional research in several areas. The GMP succinctly sums up needs in the Riverways. Final GMP approval came in October, 1984.



More than 300,000 canoeists a year take to the waters of the Ozark National Scenic Riverways, many of them becoming "incidental cavers" in a haphazard, unplanned way.



Along the Current River, Nill Cave is easily accessible to canoeists and other river users.

The most recent reports are by James E. Gardner and John Taft, Parts I and II of "Cave Resources of Ozark National Scenic Riverways – An Inventory and Evaluation," 1983 and '84. In it, the authors conducted a biological inventory of caves based on Aley's list, made some management recommendations and suggested a cave classification system for both cave life and cave hazards.

The guidelines and management recommendations of these reports are an essential step – without them there would be no direction. However, the more difficult problem remains – how to get cave manage-

ment started in a multi-resource park. Remoteness of caves, low visibility or resource degradation, lack of public pressure, and low funding priorities... all interrelated conditions... exacerbate the problems.

Ozark Riverways caves are physically remote from the people who are making management decisions. One can easily drive through a campground, check a visitor center or drive along part of the rivers. But to see the caves requires a good deal of time and preparation. The people in the field are busy dealing with the floods, canoeists, or immediate repairs to picnic areas, campgrounds, day use, etc. Few have time or the interest to go into caves to clean up litter or check for vandalism.

Public pressure for cave preservation is little and low-key. Few visitors see cave environments as fragile and easily destroyed. The crowding and litter along the rivers are their immediate concern. They can easily compare the condition of a campground, launch area or restroom. Jet boats and innertubes intrude on their recreational experience. These, then, are the subjects of letters to the Riverways or to their Congressmen. So, these are the issues dealt with by the staff based on its meager resources.

Finally, there is little money made available to deal with the problem. Priorities are set based on perceived need. Broken restroom doors, littered campsites, and crowded river conditions are given high funding priority. Caves, out of public and staff view, without baseline studies or public pressure, are low on the lists of perceived needs.

Many other Park resources suffer from these same problems. The key difference is that damage to caves or cave life takes so very long to recover. Hillsides denuded of trees during the early 1900s' lumbering era are now covered with new growth. Streams choked with gravel are slowly stabilizing, and gravel bars are re-vegetated. In little more than one generation much of the habitat disruption is healing. Deer, turkey, raccoon, fox, and other surface wildlife have come back so well through resource management that hunting is again allowed. But the gray bat and the Indiana bat, and in particular the speleotherms of many caves, need hundreds or thousands of years to recover. As managers, we can afford to delay decisions on resource preservation of surface features for several years with few ill effects.

Delay the same underground decisions and the damage may never heal.

What can be done to deal with the problems of cave management in the multi-resource Ozark Riverways? The answer lies in one word: Education... the education of both the Riverways' staff and general public. An immediate need is educating management staff members. In the long term, it is making visitors more aware of the unique and easily destroyed cave resources.

A continuing activity is an ongoing project by the Missouri Speleological Society (MSS) to survey and map caves within the Riverways' boundaries. Topographical maps of the river corridor are marked with the location of all known caves. Copies are donated to the Riverways. Currently, more than 120 caves have been mapped, about half of all known caves. Also, the MSS provides us copies of trip reports to these caves that describe in detail many features found in them. The maps and reports can be used to locate likely archeological cave sites, cave life, or bat habitats. They can help make the managers and field staff aware of the caves in their part of the Riverways and provide vital information in case of cave accident.

This past year (1984), guidelines were developed for diving in the Riverways' springs and caves. These are intended to allow continued use of the resource by experienced divers doing research... the first of their kind for any NPS area. Based on a great deal of research, they incorporate many existing guidelines of the NSS and other agencies.

The Riverways is a member of the Missouri Caves Association, a group of show cave owners from both Missouri and northern Arkansas. Bi-yearly meetings allow an exchange of ideas with the private sector.

This spring, the Park will start on a Cave Management Plan. Before becoming final, it will receive public review at several meetings.

With a grant from the American Cave Conservation Association, a survey will be made this summer of cave visitation and use. Emphasis will be on establishing estimated visitation at some of the more popular caves and developing profiles of types and percentages of cave users by seasons. Under the direction of Alan Everson (University of Missouri-Columbia), the survey will employ both direct and indirect sampling of cave visitation and users. Results of the study will be used to help develop the Cave Management Plan for the Riverways.

Public education takes many forms. Formal tours two hours long are given in mile-long Round Spring Cave. Emphasis is on deterring people from damaging caves while also helping one-flashlight groups whose batteries died halfway out.

A new cultural demonstration at Pulltite Spring will feature spring hydrology. Law enforcement rangers assist by warning or ticketing canoeists caught with speleotherms or found damaging caves. Evening programs at the five major campgrounds include various aspects of caves and springs. Emphasis is on the fragility of the resource and the need for conservation. Guided hikes at one area take interested visitors to a small wild cave to help teach proper caving skills and etiquette. Printed material includes brochures that warn of the hazards involved in caving.

The final step in the education process is the placing of advisory signs and in a few instances, gating. Starting this summer, signs will be placed in the cave entrances of many of the more popular caves. They will stress proper cave behavior and briefly cover cave systems. Gates have been placed on only four, and it is unlikely that more than 10 caves out of more than 240 ever will be gated.



Horseshoe Bend Cave is easily accessible to canoeists floating the Current River.

Internship Gives Natural Landmarks 'Shot in the Arm'

By Stephen J. Maddock

One of the present responsibilities of the National Park Service is to administer the National Natural Landmarks Program. To this end, the Park Service retains a small staff in the Washington Office to oversee the program nationally and the Regional Offices designate one individual each from their respective staffs as a Regional Natural Landmark Coordinator. In the North Atlantic Region, the Landmark Coordinator oversees a system of 90 designated National Natural Landmarks in eight states that includes 21 bogs, 23 swamps or marshes, the Old Man of the Mountains in Franconia Notch, NH, and Mount Katahdin, Maine, the northern terminus of the Appalachian National Scenic Trail. The Coordinator is also responsible for helping to identify potential landmarks for inclusion in the system and for shepherding their nomination to the Washington Office.

Unfortunately, the title of Landmark Coordinator in the North Atlantic Region is an ancillary one that usually is assumed only after the individual's other duties are sufficiently completed to permit an hour or more of uninterrupted attention to Natural Landmark matters. Thus the Coordinator's efforts often consist of little more than running a clearinghouse for the forwarding of nomination and evaluation papers from state and private sources to the Washington Office and for the delivery of official certificates and bronze plaques from Washington to the owners of National Natural Landmarks.

Given this situation, the North Atlantic Regional Office was approached last spring by an undergraduate student, Jennifer Atkinson, majoring in zoology at Connecticut College. She asked whether we would be interested in obtaining her services for the summer in exchange for one-third of her salary and a specific project for a period of 12 weeks. We asked her to explain, since this sounded like the proverbial "free lunch." She stated that she was applying for an environmental internship sponsored by EIP/Northeast, a private, nonprofit organization that assists environmental groups in obtaining talented young people for short-term employment. EIP/Northeast would pay two-thirds of her salary if she could locate an environmental organization or agency that was willing to provide the remaining salary and a significant summer project. This seemed to be a perfect opportunity to revitalize the National Natural Landmark Program within the North Atlantic Region, and without further hesitation, we agreed to help her obtain the internship she sought.

With minimal help from us, our prospective intern submitted a project outline to EIP/Northeast explaining how she planned to enhance North Atlantic's Natural Landmark Program over the course of the summer. We, in turn, indicated to EIP/Northeast our approval of her outline and our enthusiasm in having her assistance. We also signed a cooperative agreement with EIP/Northeast which enabled us to pay our financial obligation to our intern through EIP, thereby avoiding carrying her as an employee of NPS. By late May, she was working full-time on the Landmarks Program.

Continued on next page



Lynnfield Marsh National Natural Landmark is prime waterfowl habitat in Eastern Massachusetts.



Pondicherry Wildlife Refuge National Natural Landmark, Little Cherry Pond, with Mount Waumbec in distance.



Cherry Pond, with Presidential Range in distance. The highest peak (fourth from the left) is Mount Washington, site of the proposed Mount Washington Summit National Natural Landmark.

During the course of the summer, the effectiveness of the Landmarks Program was markedly increased. The usual clearinghouse efforts of the Landmark Coordinator were augmented sufficiently to enable us to provide both the Washington Office and state and private cooperators with immediate service, rather than the one to two week delay we are often forced to operate with because of other more pressing duties. Tardy evaluation reports were tracked down and their authors duly reminded to get them finished. Owners of designated, but as yet unregistered, Landmarks were contacted to see whether they would be willing to entertain registration and whether they would like to have a bronze plaque commemorating such registration. Program files were reorganized and consolidated, and each official Landmark folder was carefully checked for completeness. For once, routine business was up to date.

More importantly, we were now able to spend some time visiting existing and potential Landmarks. One of the most interesting visits we made was to the Ellenville Fault-Ice Caves NNL, located high on the main ridge of the Shawangunk Mountains in southeastern New York State. Here the Village of Ellenville proposes to develop a 130-acre parcel adjacent to the Natural Landmark as a wind energy farm. The project would consist of 71 vertical axis wind turbines that would be clearly visible on the top of the ridge, even though they could not be seen directly from the fault and the ice caves. We testified at a public hearing held in Ellenville, registering our concern that the construction of the wind turbines and the necessary access roads within the landmark could compromise the natural character for which the landmark was established. We also visited two landmarks in the White Mountains of New Hampshire, two landmarks in southern New Hampshire, one in the Berkshire Mountains of Massachusetts, three in eastern Mas-

sachusetts, and a potential landmark on Block Island, R.I.

Over the course of our intern's tenure, we accomplished a number of other important tasks. Two dedication ceremonies were held, with Mrs. Mary Lou Grier, NPS Deputy Director, officiating at each one. One of these ceremonies, marking the official registration Number 5 Bog and Jack Pine Stand in northern Maine, involved the least amount of time ever recorded between the date of a Landmark's designation and the official ceremony commemorating its recognition since the inception of the National Natural Landmark Program in 1962. We met with five of our eight State Coordinators to clarify program directives and priorities. These meetings further strengthened the program by fortifying our contacts and demonstrating our appreciation of the state-level efforts.

By the time our intern returned to Connecticut College for the fall semester, the Landmarks Program was running as well as it ever has. Evaluation reports were under way for two significant mountain top sites in New Hampshire – Mount Washington and Mount Monadnock – and peer reviews were completed for six potential landmarks that had previously received favorable evaluations. The State Coordinators in Massachusetts and New Hampshire had just contacted us in an effort to begin the process of nominating new sites as potential landmarks and the State Coordinator in Maine asked if we could help fund an effort by his state to evaluate at least one potential landmark during the ensuing summer field season. Clearly, the opportunity to have a full-time assistant assigned to the Landmarks Program had paid off.

This tremendous infusion of energy has, of course, raised the expectations of our many friends to a level that will be difficult to maintain, given the resources available to the Landmarks Program. Our State Coordinators continue to inquire about the eligibility of

additional sites for inclusion in our list of potential Natural Landmarks. We have to tell them that for each site, they must first file with our Washington Office both a description of the area and why this site should be considered worthy of Landmark status.

Once the Washington Office of Natural Landmarks determines that the area qualifies as a potential Natural Landmark, we may schedule an evaluation of the site. This site evaluation is then done by a local natural scientist, and his evaluation report is subjected to peer reviews by at least three natural scientists and staff review at both the Regional and Washington levels. Following this, a decision is finally made as to whether or not to recommend the site to the Secretary of the Interior for Landmark designation. The whole process takes at least a year to complete and usually much longer, since the site evaluation and the three peer reviews frequently involve contracts with individuals outside the federal government and these contracts are dependent upon the availability of very limited program funds.

Undoubtedly, we will not be able to process the many requests from our State Coordinators here in the North Atlantic Region as rapidly as either we or they would like. But we do hope to continue to add to our system of designated Landmarks every site that is deserving of the National Natural Landmark title and to seek ways to improve the North Atlantic Region's Natural Landmark Program.

Maddock is Environmental Specialist in the Office of Scientific Studies, North Atlantic Regional Office. Jennifer Atkinson is the Environmental Intern who assisted Maddock with his duties as Regional Natural Landmark Coordinator. She is presently finishing her undergraduate degree at Connecticut College in New London, CT.

Biosphere Reserves Conference Revisited

Editor's Note: The following article is Bill Gregg's well-received memorandum to the Associate Director for Natural Resources, Dick Briceland, and constitutes Park Science's main report on the Conference on the Management of Biosphere Reserves, held in November 1984 at the Great Smoky Mountains NP.

By William P. Gregg, Jr.
NPS Coordinator of the
Man and the Biosphere Program

From the accounts given me by perhaps a score of participants, the conference successfully articulated the biosphere reserve concept and generated considerable enthusiasm for exploring ways to put the concept into practice within the biosphere reserve units. Indeed, probably the most important conclusion reached was that the biosphere reserve designation is not simply a gratuitous honor, but can provide a framework for improving scientific perspectives on the problems we face and our ability to implement practical solutions, as well as for developing coordinated regional approaches for conserving ecosystems and biological diversity.

As underscored in the keynote address, the biosphere reserve concept is in tune with the trend toward more integrated approaches to management as protected areas become more threatened by an increasing variety of human influences and it is no longer possible to underwrite their security in isolation from their regional and, for certain pollutants at least, even global context.

The conference began in plenary with a series of presentations on the biosphere reserve concept in general, and with respect to the particular management functions of biosphere reserves: research and monitoring, natural resource management, education and training, and cooperation among different institutions and at different levels. These background sessions were followed by workshops on topics of particular concern to managers: air pollution, use of renewable natural resources, use of nonrenewable natural resources, problem species (exotics, pests and diseases), and visitor activities. These are major causes of impact, and major consumers of NPS financial and human resources.

Workshop discussions were stimulated by presentation of an overview of the impact topic (by a scientist or program authority) and a case study of a particular biosphere reserve (by the manager). In applying the biosphere reserve concepts to each of the impact topics, participants generated a wide range of suggestions for action at the policy, program, and field levels. The suggestions from each workshop, which will be included in detail in the published proceedings due by late winter, were summarized in plenary session. The conference concluded with an succinct synthesis by Everglade's Supt. Jack Morehead.

The conference's poster session, which contained about 40 exhibits and demonstrations was first-rate. The biosphere reserve concept was well-integrated into most of them. Topics included research and management programs in 15 biosphere reserves (13 U.S., one Canada, one Central America), digital cartography applications (NPS and Florida State University), museum collections in biosphere reserves, international training (University of Tennessee), the Global Environmental Monitoring Program (United Nations Environment Program), and the MAB program. Finally, we unveiled the 4-panel NPS-MAB exhibit on

biological diversity, which included a panel on the results of the ethnobotany study for the Smokies.

Some of the conclusions:

Establishing Policy. Policy-level endorsement by U.S. Government is needed (by legislation, and/or administrative action) to legitimize the biosphere reserve program.

Disseminating Information. Development and dissemination of information about biosphere reserves needs to be improved. The identity and functions of biosphere reserves, and implications for the designated areas, need to be clearly communicated to managers to provide a basis for action.

Building Biosphere Reserves. Most existing biosphere reserves are incomplete in terms of the ecosystems they contain and the functions they perform. A "complete" biosphere reserve must be developed opportunistically, often over many years, through linkages of complementary protected areas and cooperative activities. (A number of managers mentioned their desire to begin building the BR in their biogeographic region.)

Developing Multi-level Cooperation. Opportunities need to be explored for using the BR designation as a basis for expanding NPS involvement in cooperative activities at the local, regional, and international levels to improve the effectiveness of resource management.

Coordinating Projects Among Reserves. Coordination of activities between biosphere reserve units needs to be strengthened through pilot projects, especially between core areas (usually NPS) and experimental areas (usually FS).

Strengthening Long-term Monitoring. There is a need for increased support for coordinated, long-term ecological monitoring in biosphere reserves, which increasingly serve as regional and global benchmarks of environmental quality.

Strengthening Local Participation. Managers need to identify actions that can be taken to implement the BR as a regional planning and management concept in cooperation with the local community through special projects.

In addition to these general conclusions, several specific actions resulted:

National Parks and Conservation Association indicated its desire to establish a committee of interested nongovernmental organizations to promote the establishment and functional development of biosphere reserves.

Agreement was reached on initiating a pilot project involving a biosphere reserve in the U.S. (GRSM), Mexico, and the People's Republic of China. A coordinated inventory of cultural uses of the flora of each area will be developed based on the information management system for the ethnobotany project at the Smokies.

Environmental and natural history collections in biosphere reserves will receive special consideration in the ongoing revision of the NPS Museum Handbook.

Preliminary discussions were held regarding the convening of a symposium on biosphere reserves at the Fourth World Wilderness Congress (Colorado State University, Sept. 1987). I will be pursuing this possibility with Forest Service and others.

The U.S. biosphere reserve network contains many of our largest natural units and our most complex management systems. They are, in the main, well staffed by the people with extensive NPS field experience. Individually – and, more importantly, collectively – these units have exceptional potential to generate ideas and develop the new perspectives and ap-

Continued on next page

To the Editor: The Gatlinburg Man and the Biosphere Conference on Management of Biosphere Reserves appears to have achieved its goal of improving understanding of the biosphere reserve concept and generating some ideas on how to put management into practice on the ground.

A good deal has happened and much more is planned on the MAB front. I'm especially excited about the Conservation Data Base being developed by NPS, the Geological Survey, and Florida State University under the aegis of MAB, because eventually it will pull together a wealth of regional and national ecological information into an integrated system for generating maps and analyses on demand. The immediate application is in selecting biosphere reserves, but this is only the beginning. This year, I am hoping to get funds for completing a comprehensive inventory of macroreserves in the United States, which will be entered into the data base – a powerful tool for planning and keeping track of the status of protected area systems.

I am sending you information on several MAB-related matters, in the hope that they will appear in the MAB Corner. Your Winter issue continues the tradition of excellence I have come to expect from *Park Science*. I especially welcomed Jerry Franklin's remarks – Amen!

As luck would have it, my only reservation is on page 9. Why on earth would you publish a photo of the Sheraton-Gatlinburg (now Parkview) Hotel – that indecent intrusion upon the Smokies wilderness? Juxtaposed as it is with coverage of Hal Eidsvik's remarks on the integration of conservation and development, some might get the impression that such eyesores are somehow more acceptable if they're on the flanks of biosphere reserves. We're working hard to develop the correct identity for biosphere reserves, and the hotel is definitely not part of the image.

Editor's Note: The juxtaposition of huge hotel and tiny Great Smoky Mountains in the Winter 1985 issue was done deliberately with irreverent tongue in cheek.

I am enclosing a report on the meeting of MAB's International Coordinating Council in Paris, which occurred immediately following the Smokies conference. The mood was upbeat. MAB internationally has never been stronger. Of special interest to me was the adoption of an **Action Plan for Biosphere Reserves**, a set of priorities to guide support by international organizations during the next two years, the establishment of an Advisory Panel on Biosphere Reserves to provide needed oversight of the project, and the designation of new biosphere reserves, including the Mojave and Colorado Deserts Reserve in California (which contains our Death Valley and Joshua Tree National Monument among other units.)

The enclosed item (see following) on development of coordinated floristic data bases for biosphere reserves in Mexico, the People's Republic of China, and the United States, was prepared and endorsed at Gatlinburg. An automated data base developed at Great Smoky Mountains NP for the MAB ethnobotany study serves as the model for the format.

William P. Gregg, Jr.
NPS Coordinator for MAB

proaches we will need to sustain the National Park System in the years ahead.

Perhaps the major benefit of the conference was the opportunity it provided for dialogue among a dedicated and highly experienced group of NPS professionals, and the enthusiasm that resulted from this dialogue. Perhaps the best legacy it could leave would be the opportunity for these professionals to meet again from time to time to enable the Service to tape the knowledge and talent of a remarkable human resource.

Quotes of Note at the MAB Conference

From **Bob Barbee**, Superintendent of Yellowstone NP:

"You see before you a man who has just been born again. I came to this Man and the Biosphere management conference to find out how to manage a biosphere reserve. What I'm finding instead is that the biosphere reserve concepts will help me manage my park."

From **Arturo Gomez-Pompa**, tropical forest ecologist from Mexico:

"I wish to register a passionate plea for this group to take the next step – beyond establishment of biosphere reserves. The real linkage of conservation, research and development on an international scale is what the worldwide biosphere reserve network is all about."

Vascular Plant Inventory Computerization Planned

A pilot project for joint development of an information system on biological diversity in selected Biosphere Reserves was formulated and approved by participants at the November conference on Management of Biosphere Reserves, held at the Great Smoky Mountains NP. The project will establish a model for an interdisciplinary world information system on the biological resources of Biosphere Reserves.

Initial focus will be to develop a computerized inventory of vascular plants occurring within selected Biosphere Reserves in the United States, Mexico, and the People's Republic of China. The initial system, which will take advantage of ongoing projects in the three countries, will include a list of scientific and vernacular plant names, cultural uses (traditional and modern), status of each taxon, and habitat information. Bibliographic material will support and document the data base.

A steering committee will establish appropriate nomenclature, assure compatibility of data base format and management, and explore the feasibility of establishing a common data storage facility.

The project will allow for participation by Biosphere Reserves having varying degrees of available information. It will be designed for phase expansion in accordance with criteria established by the steering committee.

The initial project will be limited in scope because of the need to demonstrate the importance, utility, and feasibility of the information system and to open channels of communication among Biosphere Reserves. The minimal resources required for the project will be provided by the participating countries. Other MAB National Committees that wish to participate are invited to do so.

This project will be completed during calendar year 1985 and a report will be made available to the Council prior to the next session. The report will recommend a phased approach to the further development of the system.

Biosphere Reserve Action Plan Approved

The Action Plan for Biosphere Reserves, (BRs), approved at the Eighth Annual Meeting of the International Coordinating Council for the Man and the Biosphere Program, provides a general framework for activities from 1985-89. The following set of actions was identified as crucial for the initial two-year period – 1985-86 – and was offered as a priority guideline for governments and international organizations:

1. Setting up baseline inventories of species of fauna and flora and their present local uses (to provide the basis for further research, monitoring, and information activities).

2. Establishment of procedure for monitoring key biological parameters.

3. Preparation of a history of research, which specifies what has been carried out and includes a complete bibliography of relevant publications plus an analysis of the relationship with other ongoing pilot projects, national, or international MAB projects.

4. Establishment of a training/education program appropriate for local needs and conditions.

5. Preparation of a management plan that specifies the steps required to address the above points and to implement the ideals of biosphere reserves.

Given these minimum requirements for an effective biosphere reserve, wherever it may be located, the UNESCO Secretariat went on to identify priority actions from the Action Plan that will facilitate appropriate action by governments and other relevant institutions. These priority actions for the 1985-86 term are:

- a) **Scientific Committee:** Establish a scientific committee of experts with representatives of IUCN, ICSU, and the MAB Secretariat, with terms of reference defined in consultation with the Bureau of the MAB-ICC. The two main tasks of this committee will be to oversee the implementation of the BR Action Plan and the evaluation and recommendation of new BR nominations.

- b) **Management Handbook.** Prepare and publish a handbook on BR management, to include criteria and guidelines for selection and establishment of BRs, managerial requirements for BRs, and institutional arrangements for administration and management of BRs.

- c) **Biological Inventories.** Establish and demonstrate methodology for inventories of plant and animal resources and their local uses. This would involve development of methodology for inventories, two or three demonstration inventories in BRs in different parts of the world, compilation of data on species in BRs, and promotion of biological inventories to be carried out in each BR.

- d) **Monitoring.** Workshop to identify parameters of global significance that can be easily and inexpensively monitored on a long-term basis and to develop standardized, sound, and widely applicable methods for collecting and comparing data; publication and wide dissemination of results from the workshop for adoption and implementation in all BRs. Would include monitoring of status of endangered species, ecosystems under threat, a survey of human impacts in BRs, and indicators of environmental trends.

- e) **Information Network.** Feasibility study on BR Information Network, to include development of a protocol for histories of research, mechanism for information exchange on *in situ/ex situ* conservation; methods for collecting and disseminating information of facilities available in BRs, analysis of structures of decentralized systems to deal with collection, storage,

synthesis, evaluation, and dissemination of knowledge; definition of potential users of the system; definition of mechanisms for spreading knowledge within the BR network, and means for promoting continuing professional relationship and exchange of people among BRs.

- f) **Research.** Guidelines for promoting research in BRs, specifying appropriate methodologies (to promote comparison of research findings and exchange of knowledge); types of research projects that are particularly appropriate in BRs; ways and means of developing collaborative and comparative programs of research; how to promote more MAB-related research in BRs, and how to establish a research program suitable for the local conditions and requirements for research information.

- g) **Training and Education.** Preparation of guidelines for developing training and education programs at all levels for BRs.

- h) **Management Planning.** Preparation of model management plans for four BRs in various parts of the world, involving guidelines for preparing management plans based on FAO and IUCN models already existing but modified for specific BR requirements; workshops to be held in the BR to enable involvement of local BR manager, researchers, and staff plus those from other BRs in the same country; and publication and wide dissemination of the model arrangement plans.

- i) **Traditional Use.** Development of a pilot project on how development may be based on local knowledge and sustainable use of living resources, applying the information obtained by other relevant MAB projects to real problems on the ground. The project proposal then would be promoted to development agencies for funding.

- j) **Degraded Ecosystems.** Development of pilot project on recovery of degraded ecosystems in, for example, the Sahel, based on knowledge obtained under MAB work in arid lands being applied to a particular biosphere to be selected. The project proposal would then be promoted to development agencies for funding.

- k) **Conservation Science.** Support for 1985 conservation biology conference including publication of state-of-the-art volume on conservation biology, development of project for subsequent period.

- l) **Publicity.** Preparation and distribution of a pamphlet on BRs designed for the general public and for people living within or around BRs. Published in English, French, Spanish (plus other languages by national MAB Committees.)

Correction!

Live wires in the Pacific Northwest Region's cultural resources division spotted a caption error on page 15 of Winter 1985 *Park Science*. The page contains two photos that didn't reach the editor in time to appear with their related stories in the Fall 1984 issue. One of them attributes the seemingly backward sash on a member of the English Royal Marines to the soldier's "individuality." Not so! The reversed sash, we are told, designated the wearer as the highest non-commissioned officer in the group – probably in this case a drill sergeant. Our profound editorial apologies to the memory of the marine – and the back of our editorial hand to Research Biologist James Agee, who gave us the bum steer!

Biosphere Reserves or World Heritage Sites – Which is Which?

By Roland H. Wauer
Asst. Supt., Great Smoky Mountains NP

Editor's Note: Following is a January 9, 1985 memorandum from Wauer to all superintendents of Biosphere Reserves.

Two very significant concepts for protecting natural and cultural resources – Biosphere Reserves and World Heritage Sites – were designed in the mid-1970s and implemented by the international community as part of a progressive and worldwide conservation strategy.

These two concepts have many similarities, because both are designated for preserving significant resources throughout the world. Both attempt to bring greater international visibility to the sites, and to use public support as a means to safeguard the important natural and cultural resources therein.

The creation of World Heritage Sites evolved from the idea that certain natural and cultural sites have universal value and are worthy of international recognition, respect and protection. This program has authority through the Convention Concerning the Protection of the World Cultural and Natural Heritage, ratified by the United States Senate on October 26, 1973, and the Natural Heritage Protection Act Amendment of 1980.

Criteria for World Heritage Site selection include those truly unique sites that had an impact upon history, illustrate significant geological processes, may be crucial to the survival of threatened plants and animals, or contain features of superlative natural beauty. The natural sites "ensure the maintenance of the natural diversity upon which all mankind depends."

The World Heritage program includes a World Heritage Fund that is designated to support individual efforts of countries to preserve their cultural and natural heritage, and to meet emergency conservation needs to save a property that is in imminent danger of destruction.

A World Heritage Committee acts to further the goals of the program, which include: (1) developing and maintaining a site list; (2) preparing a list of World Heritage in Danger (both lists are updated every two years); (3) establishing a fund to assist participating countries in identifying, preserving, and protecting World Heritage designated properties; (4) providing technical assistance upon request; and (5) promotion and enhancement of public knowledge and understanding of the importance of heritage conservation at the international level.

The creation of Biosphere Reserves evolved from the Man and the Biosphere (MAB) program, a product of UNESCO, as a method of protecting animal and plant resources in a coordinated worldwide network of designated areas. Participation in the Biosphere Reserve program is strictly voluntary. There is no international convention or legal basis for designation or methods of operations. Authority relates to Agency establishment acts and other land protection legislation.

Criteria for Biosphere Reserves include: (1) areas that can form a network of international understanding of purpose, standards and exchange of scientific information; (2) representative examples of natural biomes, communities or areas with unusual features of exceptional interest, examples of harmonious landscapes resulting from traditional patterns of land-use, and/or examples of modified or degraded ecosystems that are capable of being restored to more-or-less natural conditions; (4) areas large enough to be an effective conservation unit, and to accommodate different uses without conflict; (5) opportunities for ecological research, education, and training; (6) areas with adequate long-term legal protection; and (7) areas to coincide with, or incorporate, existing or proposed protected areas.

The primary goals of Biosphere Reserves are to (1) conserve for present and future use the diversity and integrity of biotic communities of plants and animals within natural ecosystems and to safeguard the genetic diversity of species upon which their continued evolution depends; (2) provide areas for ecological and environmental research, including baseline studies, both within and adjacent to such reserves; and (3) provide facilities for education and training. The Biosphere Reserve program is designed to place heavy emphasis on conservation, research, monitoring education and cooperation.

The present total is 165 World Heritage Sites in 43 countries; eleven of the 165 sites are located in the United States (June 1984). There are 226 Biosphere Reserves in 62 countries; 40 of the 226 sites are located in the United States (October 1984).

MAB/ICC Meeting Attended by U.S. for Last Time

The proposed U.S. withdrawal from UNESCO at the end of calendar year 1984 raised the importance of the December 1984 Eighth Annual Meeting in Paris of the International Coordinating Council for the Man and the Biosphere Program so far as the United States was concerned. The meeting provided the last opportunity for the U.S. to participate formally as a member of the ICC.

According to William P. Gregg, Jr., a member of the U.S. delegation, Delegation Chairman Bill L. Long (Director, Office of Food and Natural Resources, U.S. Department of State) emphasized the United State's strong support for MAB and the intention of the U.S. to establish mechanisms for strengthening U.S. involvement in future MAB activities.

Key outcome of the meeting was a series of ICC decisions that will have the effect of minimizing the short-term impacts of U.S. withdrawal from UNESCO so far as U.S. effective participation in MAB is concerned. Most important of these decisions were:

1. Establishment of MAB Advisory Panels. The ICC established two advisory panels to assist the ICC in planning and implementing various aspects of the MAB program. One of the panels will deal with the overall MAB program and will help the ICC establish priorities and recommend strategies for developing existing projects and launching new initiatives, particularly in complex fields such as integrated modeling and forecasting.

The other panel will review biosphere reserve nominations and provide professional oversight of the

development of the international network and its functions. As both bodies are technical and advisory rather than governmental, U.S. authorities will be eligible to participate, thus providing a vehicle for continuing U.S. involvement in the development of MAB internationally.

Gregg was requested by the UNESCO Secretariat to recommend terms of reference for the biosphere reserve panel that will become operational this year. If properly structured, Gregg said, this panel can help improve the quality of available information on biosphere reserves, improve objectivity in biosphere reserve selection, provide needed guidance for developing biosphere reserve functions, and generate institutional support for biosphere reserves.

"Further," Gregg said, "the panel will offset the limitations of the MAB Bureau, which has reviewed biosphere reserve nominations in the past, but which, by its own admission, lacks the professional expertise to do so – much less to provide the oversight the project requires."

"From the NPS perspective," Gregg said, "I believe that the panel can help provide the additional guidance our biosphere reserve managers will need as the concept continues to evolve. That such guidance is needed was repeatedly underscored in the November 1984 Gatlinburg conference on management of such reserves."

2. New MAB Appointments. Dr. Gonzalo Halffter, deputy director of Mexico's National Council on Sci-

ence and Technology, and chairman of MAB Mexico, was elected chairman of the ICC. Dr. Halffter is the architect of Mexico's biosphere reserves, widely regarded as the most successful in the developing world. Canada was elected to the MAB Bureau, in effect replacing the United States. This was viewed by Gregg as a positive development, particularly now that the U.S. is no longer in UNESCO.

3. Adoption of Action Plan for Biosphere Reserves. The principal accomplishment of the First International Congress on Biosphere Reserves (Minsk, USSR, October 1983) was adoption of a set of objectives and recommendations to provide a general framework for implementing the BR project. This material was used by the UNESCO MAB Secretariat as a basis for an Action Plan for Biosphere Reserves, made available to ICC in draft form well in advance of the Paris meeting.

In an early session, member states raised a variety of concerns about the draft plan, as a result of which Gregg and five others were appointed to a working group (chaired by Gregg) to address those concerns. The result was a plan and a two-year program that were adopted by the members with what Gregg reports as "considerable enthusiasm." The approved plan Gregg called "consistent with the approach we are taking to implement the biosphere reserve project in the U.S., and should prove a useful blueprint for its future development."

Continued on next page

4. No Across-the-Board Cuts. A consensus emerged that MAB, as one of UNESCO's most successful programs, should be highly competitive in any future reallocation of funds within UNESCO. Future reduction in UNESCO funding for MAB was not assumed as a given for planning purposes. After considerable debate, it was decided that any cuts would be made in individual field activities, and that no across-the-board deletions of established MAB projects, such as island ecosystems or urban systems, will be made.

"This decision," Gregg observed, "helps assure that MAB will remain a global program with benefits to all participating nations, and that field activities will be prioritized on the basis of merit and consistency with the purpose of MAB."

5. MAB Bureau Review of Biosphere Reserve Nominations. Each year the MAB Bureau reviews biosphere reserve nominations submitted by MAB National Committees. This year, 24 biosphere reserves were nominated. Seventeen were approved and ten were deferred for consideration by the Advisory Panel on BRs later this year. The Bureau's action brings the total number of biosphere reserves to 243 in 65 countries.

In the U.S., the Bureau approved the Colorado and Mojave Deserts BR, containing Death Valley and Joshua Tree NMs among other sites. This brings the total number of U.S. BRs to 41. The Carolinian-South Atlantic BR was deferred by the Bureau because of comments by the UNESCO MAB Secretariat relating to lands administered by the State of Georgia, which declined to participate in the nomination. In addition, the nominations for Copper River Delta BR and the Glacier Bay-Admiralty Island BR in Alaska were withdrawn because the U.S. Forest Service had not yet formally endorsed them. In Mexico, the Pinacate BR (adjacent to Oregon Pipe Cactus NM in the U.S.) nomination was withdrawn for lack of necessary endorsements by the Mexican government.

6. Recommendations for Future Action. In a memorandum to the NPS Chief of International Affairs, Gregg made the following recommendations:

a) NPS should make the approved Action Plan for Biosphere Reserves available to Regional offices and to personnel responsible for planning and management in the 23 NPS units included within biosphere reserves. Particular attention should be given to full consideration of the objectives and recommendations of the Plan in development of Statements for Management, General Management Plans, Resource Management Plans, and other planning documents.

b) The Park Service should support establishment of the Advisory Panel on Biosphere Reserves and contribute in any way possible to its success.

c) NPS should continue its traditional support of the U.S. MAB Program, including funding for the U.S.-MAB Secretariat and selected projects involving biosphere reserves.

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